

ON THE CONSTANCY AND VARIABILITY OF THE  
DIFFERENCES BETWEEN THE OLD WORLD SPECIES OF  
*UTETHEISA* (LEPID.; *ARCTIIDAE*).

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(With 30 text-figures.)

THE pretty Arctiid speckled with black and scarlet on the creamy-white ground of the forewing which favours this island by an occasional visit, and makes the heart jump in the breast of collectors old and young who know what is the white flake they see flutter in the air, belongs to *Utetheisa*, a genus of fourteen species, three of them being American and the others occurring in the Old World, mainly in the tropics. They are all closely related to one another, perhaps with the exception of *U. galapagensis* Wallengr. 1860, which stands apart, because its female (the ♂ is not known to me) has the antenna dentate, whereas in that sex of all the other species the antenna is simple. With this exception, the structure and colouring prove the species to form a compact natural genus, the relationship being unmistakable. On closer investigation the genus proves nevertheless to be a bundle of contradictions which obscure the real relationship of the species with one another and have led the systematists astray in their attempt to group the species in a natural order. But putting the counters into their right places is only the beginning of a game. The species have arisen from a common basis, each species representing the ancestor in a specifically modified form. The differences acquired and the similarities retained are facts before us that ask for an enquiry into their meaning. Speaking of the genus in the aggregate, the specific distinctions (or "specifics" for short) refer to the colour and pattern of the wings (hereafter called coloration), the genital armature of the male (segments IX and X of the abdomen) and female (sternum VII), the tarsal claws, and, in the male only, to the antenna, the hindleg and a scent-organ on the hindwing.

The pattern of the wings of Lepidoptera being under the influence of the neuration, it probably consisted originally of ill-defined stripes along the veins and in the folds between the veins; these stripes broke up into spots forming rows between the veins and across them. Such a groundwork of the pattern is preserved or indicated in *Utetheisa* and many other Arctiids (inclusive of Hypsids). The original pigment derived from the haemalymph was probably black and red, amalgamated into brown or separated as red and black patches or spots, unpigmented scaling filled with air being white. The primitive colours red and black or the modifications of red (orange, yellow and white pigments) are characteristics of many Arctiids. In this respect the most primitively coloured *Utetheisa* evidently is the American *U. bella* L. 1758. This common insect presents the three principal stages in the evolution of wing-colour, the forewing being either scarlet or yellow and the hindwing scarlet, yellow or white. The two American *U. bella* and *ornatrix* L. 1758 would be excellent subjects for the experimental study of colour-development and variation; they are easily bred and produce several generations a year. Somebody might take up these insects instead of *Drosophila*.

The upper- and undersides were alike in the ancestral *Utetheisa*, as they still are in the females of *Argina* Hübn. 1819. The black spots of the upperside became reduced and acquired pale rings in *U. bella* and in the males of *Argina*. The uppersides remain at some such early stage in *bella*, *pulchella*, *pulchelloides* and *lotrix*, while in the other species the modification of the pattern proceeded farther. As in most moths, the evolution of the exposed upperside of *Utetheisa* has not been the same as on the concealed underside. The highest development of the *Utetheisa* coloration is found in *elata* (inclusive of *fatua* from the African Continent), in which, in contradistinction to all the other species, the two sides are almost identical; evolution having started with similarity of the upper- and undersides terminates in this species with both sides strongly modified, but again nearly alike.

The Old World species nearest the ancestral coloration are *U. pulchella* L. 1758, *U. lotrix* Cram. 1777 and *U. pulchelloides* Hamps. 1907. For the sake of simplification these names cover in this general survey all the subspecies as well as those geographical representatives which we consider to have attained specific rank. In all three species the forewing is creamy white speckled with black and red; there are exceptions with predominantly red forewing. The hindwing is white with black distal border, which is missing in most specimens of the Sumatran *U. sumatrana* with red forewing. The spots of the forewing are in the same position in *pulchella*, *pulchelloides* and *lotrix*, and although they are variable in size and number within each species, no differences in coloration have developed by which one could with certainty separate one of these three specific populations from the other. Mr. W. H. T. Tams pointed out to me about a year ago that *U. pulchella* bears behind the base of the cell a black dash not found as such in *U. lotrix*, and that the last two marginal spots are elongate in *lotrix* and short and round in *pulchella*. This combination of differences would be a good guide if it applied to all the specimens. Unfortunately quite a large proportion of *pulchella* is without the basal dash, and the specimens of *lotrix* from New Caledonia and Lifu and many examples from other localities possess a black spot instead of the dash of *pulchella* (very rarely a dash). This spot, however, is usually placed on the median vein, not behind it; in *pulchella*, on the other hand, the dash extends rarely on to the vein, and if it is abbreviated, its remnant is usually at some distance from the base. As regards the posterior marginal dots, they are elongate in nearly every Oriental specimen of *lotrix*, but in the African *lotrix* rarely larger than the dots in front of them and often smaller, while in *pulchella* the posterior spots are frequently distinctly enlarged. In spite of the instability here pointed out, there is something distinctive: the presence of well-elongate posterior marginal spots and the absence of the basal dash are a combination found frequently, in certain districts normally, in *lotrix*, but not in *pulchella*.<sup>1</sup>

<sup>1</sup> In Curtis's figure, *Brit. Entom.*, pl. 169 (1827), the two spots are elongate, less so in the original drawing (in the Tring library) than in the published copy; the basal dash is present in both. The scarlet spots of the original drawing appear to the naked eye dark olive-tawny in the published plate, being under the lens pale scarlet shaded with purple.—The great convenience of the Tamsian distinguishing characters for a rapid examination of material was demonstrated to me when I looked at the series of 16 specimens placed as *pulchella* in the British collection at Tring; one of them caught my eye on account of the elongate posterior marginal spots: it was *U. lotrix*, not *pulchella*. The specimen, a ♀, is labelled "Dartmouth, Sept. 16th, 1892. F. Jackson." The label has several pinholes, and I doubt that the specimen is the original one. It came to Tring with the Gibbs collection. The nearest locality of *U. lotrix* is Senegambia (a subspecies recognizable in the male only).

The specimens of *U. pulchelloides* can be separated, more or less, into four groups according to the features discussed: (1) basal dash present, posterior marginal spots small; (2) basal dash present, posterior marginal spots elongate; (3) basal dash absent, posterior marginal spots elongate; (4) basal dash absent, posterior marginal spots elongate. The second combination occurs only among the specimens of *U. pulchelloides*, of the three species here discussed.

These unstable distinctions do not affect the appearance of the moths at all; in the specimen at rest or on the pin they are only discovered after a close scrutiny and are invisible in a flying specimen, which looks white. The persistence of minute somatics which as such have obviously no function are a feature common to many species. For instance, the posterior end of an oblique discal band on the forewing, or of a row of spots, often remains present in Arctiids; spots which can be seen neither in resting nor in flying specimens are a character of the same kind: a remnant carried along because it is innocuous in the life of the individual. The two marginal dots in front of the tornus of the forewing remaining usually separate on the upperside in these three *Utetheisa* are an ancestral relic probably unique in *Arctiidae*, or at any rate very rare, as I have not seen another example outside *Utetheisa* in cursorily searching for one in the Tring collection. Elsewhere in the family the two have often coalesced into one spot, which is frequently larger than the one in front of it.

A similarly inconstant distinction between *U. pulchella* and its allies is met with on the underside of the forewing. The species similar to *pulchella* in pattern (we exclude *U. antennata* from this discussion, its pattern being different) have a black discal band which projects towards the apex of the cell. The black discocellular bar is either connected or amalgamated with this projection or remains completely separate. The connection consists often of only one or two lines on the veins, and the bar is not infrequently free on one wing and connected or amalgamated on the other. In the following Table I we unite under *U. pulchella* and *U. pulchelloides* all the subspecies, because these show no essential differences in the percentages (the actual figures will be given in a later table when dealing with the subspecies); *U. lotrix*, however, is here divided into four sections on account of an interesting difference in the percentages. The table demonstrates several facts in variation of which the significance will be appreciated if we consider that amalgamated elements of pattern represent a later stage of evolution than separate original elements.

TABLE I.

PERCENTAGES OF FOREWINGS IN WHICH THE DISCOCELLULAR BAR OF THE UNDERSIDE IS CONNECTED OR AMALGAMATED WITH THE DISCAL BAND.

	<i>U. pulchella</i> , Ethiopian and Palaeartic Regions, India.	<i>U. amhara</i> , Africa.	<i>U. solomons</i> , Solomons, etc.	<i>U. pulchelloides</i> , Oriental Region to Mada- gascar.	<i>U. lotrix lepida</i> , Ethiopian Region.	<i>U. lotrix lotrix</i> , Australia to India.	<i>U. lotrix lotrix</i> , New Guinea.	<i>U. lotrix stigmata</i> , Solomons, etc.
Number of forewings .	2,790	378	56	1,132	146	540	54	46
Percentages . . . .	4%	14%	87%	80%	0%	2%	44%	41%

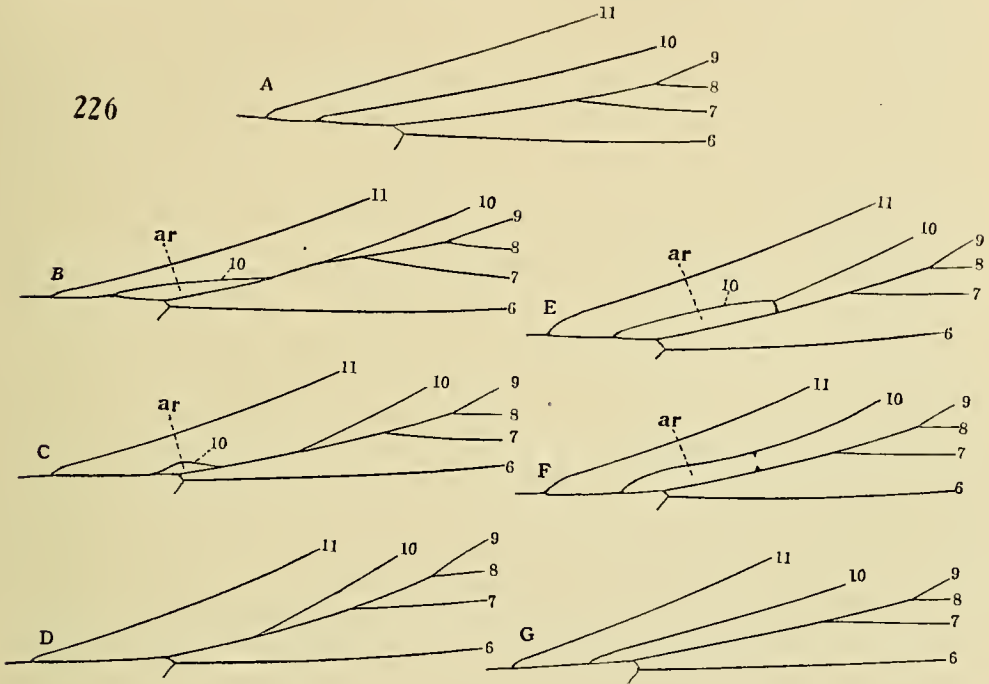
In this particular detail of pattern *U. pulchella*, *U. lotrix lepida* and *U. l. lotrix* are primitive. The low percentage of *U. amhara*, which represents *pulchelloides* in Africa, but has no tuft on the male hindwing, is interesting,

contrasting very strongly with the percentages of *U. salomonis* and *U. pulchelloides*. Although *U. amhara* has the same type of genitalia and male antenna as the two others, the relationship is evidently not very close; it appears as a primitive in the table, whereas the two others are advanced. *U. salomonis*, on the other hand, which agrees with *U. amhara* in the absence of the scent-organ on the male hindwing, does not contrast at all with *U. pulchelloides*, the various subspecies of which show a variation from 75 to 100 per cent.; it is geographically surrounded by subspecies of *U. pulchelloides* and fits very well into the series, apart from the missing tuft of the male hindwing. The relationship with *U. amhara* is much more remote.

*U. lotrix* is divided into four sections in the table; the African subspecies again shows the lowest percentage, there being no connection between bar and band (as is also the case in the Angolan *U. pulchella kallima*); in Indo-Australian *U. l. lotrix* the percentage is only half that of *U. pulchella*. It is therefore very surprising that in New Guinea (not in Australia!) the percentage rises to 44 per cent., though there are no other differences from *U. lotrix lotrix*. Approximately the same percentage is found in *U. lotrix stigmata* from the Solomons and neighbouring groups of islands, but here the rise is accompanied by other colour differences, the population having attained the status of a subspecies, while the New Guinea population has not.

An attempt to find in the neuration of *Utetheisa* some distinctions corroborating and supplementing the specific and subspecific differences has incidentally had the unexpected result that the specimens proved the current diagnosis of *Utetheisa* to be only partially correct. The neuration is very variable in all the species, especially the subcostal veins of the forewing. It is generally stated that the forewing of *Utetheisa* has an areole or even two areoles; only Lord Rothschild, in Seitz, vol. x, p. 260 (1914), varied the diagnosis in stating that an areole is frequently present. In order better to understand the variability and its meaning for systematics, we insert here seven diagrams (text-fig. 226); B to G are based on actual specimens of *U. pulchella*; A represents a phase in the pupal wing in which vein 10 is still free (in this phase 6 to 9 would not yet have acquired the position they have in the figure; but we may overlook that inaccuracy, as we only wish to illustrate the subsequent relation of 10 with 8.9. We also employ here Herrich-Schäffer's system of numbering the veins, because most diagnoses of *Utetheisa* are written that way). In a later pupal phase 10 bends down, approaching 9 beyond the end of the cell, amalgamating with it for a short distance or becoming connected with it by a bar, an areole (ar) being formed (figs. B and E). We can group the specimens of *U. pulchella* in two series; in the left series B represents an individual in which the coalescence of 9 and 10 is short; in C it has gone so far that the areole is much reduced; in D the areole has entirely disappeared. We find examples of all intermediate stages between B, C and D. In the right-hand series fig. E is a specimen with the bar developed; fig. F another in which the bar has remained incomplete; and in fig. G a third with no trace of the bar, this being a more ancestral phase than any of the others, and D the most advanced. If one follows Hampson's Key to the Genera of *Arctiidae* in his great work, *Lep. Phal.*, iii, p. 2 (1901), the characters of B and E would lead to p. 8 of the Key, where *Utetheisa* is found; perhaps C and F might also lead to p. 8; but D would land us at b<sup>3</sup> on p. 4 and G at c<sup>3</sup> on p. 5, far away from *Utetheisa*. These are not the only modifications

of the neuration considered in Hampson's Key and his descriptions of genera as being of generic value. Vein 11 sometimes branches off from 10, which modification leads us to *Pachydota* and *Baritius* without areole or to *Tyria* with areole. The very long and narrow areole present in a large percentage of *U. bella* and *ornatrix* leads to *Rhodogastria*, specimens of these American species with a shorter areole to *Utetheisa* and those without an areole to *Protomolis*. The position of vein 7 also is not so constant as in our figures B to G; in specimens represented by B, C, D and E its point of origin is sometimes on a level with that of 10 or more proximal, and occasionally 7 arises from the posterior side of the areole.



Spuler, *Schmett. Europ.*, ii, p. 149 (1906), and Rebel, *Berge's Schmetterlingsb.*, 9. Aufl. p. 435 (1910), attribute to *U. pulchella* a double areole. I have found an anomaly of this kind only once in over 2,800 forewings of *Utetheisa* examined, and in this case the areole was divided by a transverse bar. In none of the species of *Utetheisa* have neurational characters been consolidated into constant specifics. Nevertheless, there is here something of the nature of Tams's semi-specific recognition marks of *U. lotrix* described on p. 225, as is very apparent in Table II on p. 256.

The vertical divisions of this table are the same as in Table I. The horizontal divisions are grouped into two sections: with areole and without areole. This grouping is artificial, but is here adopted because the presence and absence of the areole are generally considered of very great weight in the classification of Arctiids (and other moths). The stalk of vein 10 with 8.9 is counted as long if it is at least half the length of the transverse diameter of the cell (at its widest point). Vein 10 frequently arises from or from close to the apex of the areole together with the stalk of 8.9; if the distance of 10 from the tip of the areole is less than twice the width of the short vein common to 10 and 8.9, vein 10 is

counted as arising from the areole ; if in doubt, 10 is counted as short-stalked with 8.9.

TABLE II.

THE VARIATION OF THE POSITION OF VEIN 10 OF THE FOREWING EXPRESSED IN PERCENTAGES OF THE WINGS EXAMINED.

	<i>U. pulchella</i> , Ethiopian and Palearctic Regions, India.	<i>U. amhara</i> , Africa.	<i>U. salomonis</i> , Solomons, etc.	<i>U. pulchelloides</i> , Oriental Region to Mada- gascar.	<i>U. lotrix lepida</i> , Ethiopian Region.	<i>U. lotrix lotrix</i> , Australia to India.	<i>U. lotrix lotrix</i> , New Guinea.	<i>U. lotrix stigmata</i> , Solomons, etc.
Number of forewings examined . . . . .	880	378	56	738	146	400	54	46
With areole :								
(a) Vein 10 from areole . . . . .	11%	56%	75%	55%	73%	75%	82%	78%
(b) Vein 10 on short stalk with 8.9 . . . . .	41%	29%	21%	36%	20%	19%	5%	20%
(c) Vein 10 on long stalk with 8.9 . . . . .	31%	1%	2%	3%	1%	1%	2%	0%
Without areole :								
(d) Vein 10 stalked with 7.8.9 . . . . .	15%	2%	0%	1%	0%	1%	0%	0%
(e) Vein 10 direct from cell . . . . .	2%	12%	2%	5%	6%	4%	11%	2%

The most primitive of the five modifications (a)–(e) embodied in the comprehensive survey presented by Table II is (e), then follow (a), (b), (c) and (d), the most advanced modification being (d) (cf. text-fig. 226, D, on p. 255). In many wings the areole is reduced to a small groove, (c) being but a little less advanced stage than (d). It is evident from the percentages that *U. pulchella* has a singularly isolated position as regards neuration. The very low percentage of (a) contrasts very strongly with the high percentages of the other species. Still more striking is the difference between *U. pulchella* and the others in the most advanced modifications (c) and (d), the two together amounting to 46 per cent. in *pulchella* as compared with at most 4 per cent. elsewhere. There are two other points in the table worthy of note : in *U. amhara* and the New Guinean population of *U. lotrix lotrix* the number of wings with modification (e) is comparatively high, and in the New Guinean *lotrix*, moreover, modification (b) is much rarer than in *U. lotrix stigmata* from the Solomons (whereas in Table I the two agree closely).

An interesting point not brought out in the table is the frequency of a difference in the two forewings ; the left wing may belong to one category and the right wing to another. That is the reason why Tables I and II are based on wings and not on specimens. In *U. amhara*, for instance, 28 per cent. of the right and left wings are different. Conspicuous asymmetry is known of the pattern of some Lepidoptera, for instance *Uraniidae*, but as a rule the differences between right and left wings are small, and may be attributed to the incidents of growth, variability prevailing everywhere. But vein 10 arising in one forewing from the cell and being stalked with 7.8.9 in the other is a difference which the strict neurationist would have to consider of generic value and cannot be waved aside as coming under the general rule of slight individual variability. The reason for vein 10 stopping at stage (a) in one wing and going on to stage (c)

in the other will probably be found in the equilibrium of the development in the pupa being upset by external factors acting upon the caterpillar when changing into the pupa or upon the chrysalis at the critical moment in its development. The pupa lies in a flimsy cocoon on the ground among debris. We cannot attribute the asymmetry to a faulty action or an unequal distribution of a directing hormone. That assumption would mean assigning the variability of the neururation to the unexplained variability of a hormone, which would leave us in ignorance.

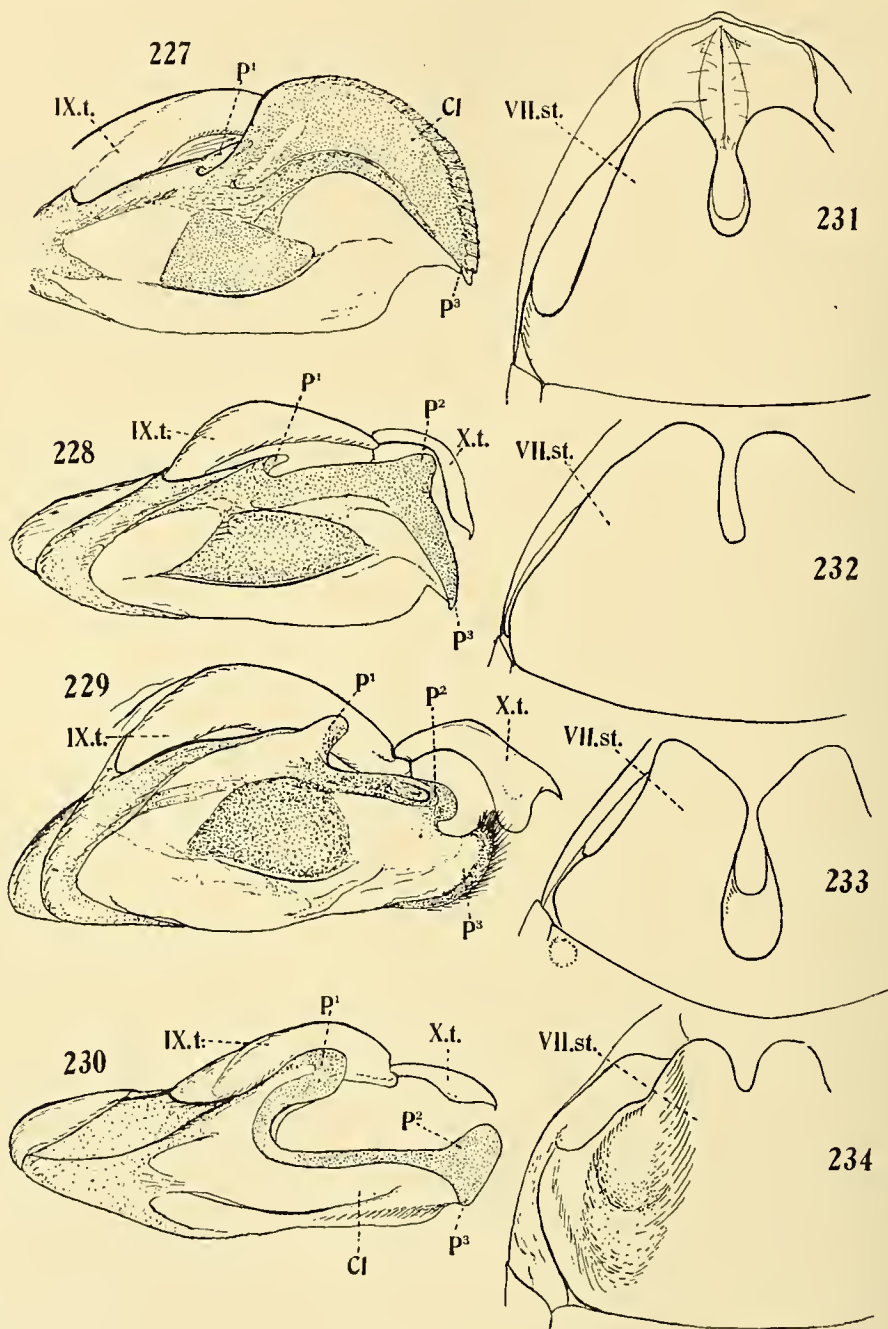
However that may be, the example here demonstrated of the instability of the neururation within a genus of closely related species teaches the taxonomist the primary lesson that classification should not be mainly based on an organ the variability of which has not been previously studied. As the range of variability can only be ascertained from a sufficiently large material, it follows that collections consisting of a limited number of specimens are inadequate for obtaining reliable results, for which reason we mention in the tables the number of wings examined.

When some 20 years ago I looked at *Utetheisa* with a view to ascertain the real status of some types in the Tring collection, I was greatly astonished to find, after the elimination of the males with pectinated and dentated antennae, that the remaining mass of seemingly unclassifiable material similar to *pulchella* was very readily separable into three groups according to the external structure of the genitalia of both sexes. An impossible task if coloration only were examined became quite easy with the help of the binocular microscope. Text-figures 227-234 require no description at this point, the differences staring one in the eye. I was further struck by observing: (1) that subspecies different in coloration or even in some structure did not yield any difference or only a slight one in the genitalia; and (2) that individual variability, so frequent and conspicuous in the coloration and neururation, was hardly noticeable in the genitalia. The genitalia and the coloration vary independently, as I had found out long ago from the study of the individual and geographical modifications in the genitalia of *Papilio* (1896).

With the result of the examination of the three externally so similar species *pulchella*, *pulchelloides* and *lotrix* before me, I expected the externally dissimilar species to exhibit even greater differences in the genitalia. The expectation was fulfilled by *U. semara* Moore 1859 from Java, Celebes and Lombok (text-figs. 230, 234); but the remaining Old World species, all from the Malagassic subregion (*elata*, *cruentata*, *lactea*), tell a very different and surprising tale: their genitalia are alike. In these species evolution has gone ahead in the coloration, whereas the genitalia have remained stationary; just the opposite from what we find in *pulchella*, *pulchelloides* and *lotrix*. The two Americans, *bella* and *ornatrix*, are likewise different in colour and alike in the genitalia.

The contrast between the Malagassic species on the one hand and the three species with the *pulchella*-pattern on the other does not entirely conform with the relationship of the species. Superficially it looks as if we had here two natural groups in each of which the species were closely related; but that is not so, for *pulchella* does not belong to the group to which the forewing coloration would seem to assign it. The genitalia of *pulchella* female are indistinguishable from those of the three Malagassic species and the male genitalia show only slight differences. This is the more unexpected because the males of the Malagassic

*Utetheisa* differ further in bearing on the hindwing a scent-organ which is absent from *pulchella*, and in having slightly different antennae. That *pulchella* is more nearly related with the Malagassic *elata*, *cruentata* and *lactea* than with the other



*Utetheisa* is not really strange, considering that it is an essentially African insect. What we have said about the coloration in the previous lines applies equally to both sexes.

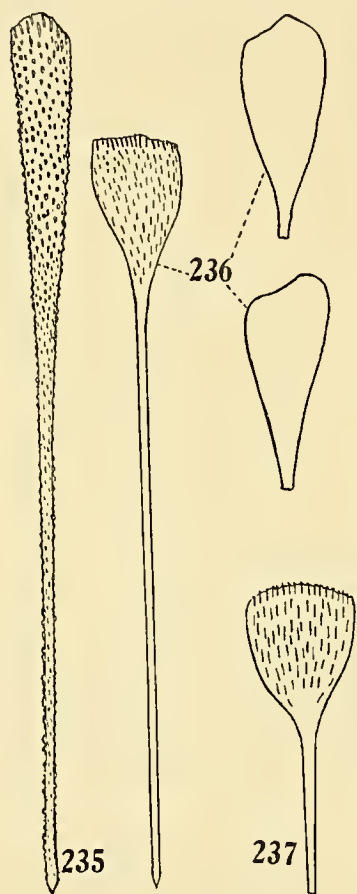
The abdominal segments modified for facilitating a firm union of the sexes



form in *Utetheisa* five different lock-and-key arrangements (*galapagensis*, no doubt, presenting a sixth, not yet known), and, though each such arrangement may be regarded as a single unit from the viewpoint of function, the somatic contribution of the sexes is different and does not necessarily show the same amount of variability and variation. In *Utetheisa* this genital armature is remarkably constant in the individuals from widely different districts. But while the female armature remains the same throughout each species, the male claspers are modified to a slight extent in some subspecies of *U. pulchella* and *U. lotrix* and in some geographical representatives of *U. pulchelloides*. This difference of the sexes in the evolution of the lock-and-key arrangement is probably more apparent than real; the male organs being much the more complicated of the two, a difference is more easily noticed. A "law," however, that the male is here in advance of the female should in any case not be based on the examination of dry specimens only. The clasper of the American type is much narrower than in *pulchella*, broader than in *semara*, to which it is similar, and simpler in outline than in *pulchelloides* and *lotrix*. The basi-dorsal process ( $P^1$ ) is much longer than in any Old World species, as is also the anal tergum; the dorsal margin is formed, as in *semara*, by a strongly chitinized tube, distally somewhat bent down and projecting beyond the membranous apical margin; the ventral half of the innerside is densely covered with hairs and scales. In *pulchella* we find the dorsal margin enlarged upwards, and both *lotrix* and *pulchelloides* have a subapical ( $P^2$ ) and an apical process ( $P^3$ ), which differ very conspicuously in the two species. In the female it is sternum VII which is modified, the general type remaining the same in all species inclusive of *galapagensis*. That of the American ♀♀ is the most primitive type: the median sinus is small and shallow; the deeper sinus of the Old World *Utetheisa* is probably a later acquisition. *U. galapagensis* has a somewhat deeper sinus than *bella* (and *ornatrix*). It is not necessary to comment further on sternum VII; the specific differences obtaining in that segment will be described in the systematic section of this paper. There is only one point to which I should like to draw attention: in *lotrix* there is at the lateral apical corner of this segment a small smooth groove concealed by the apical margin of sternum VI and appearing in the inside of the body as a smooth dome. The groove is not present in any other species and its function is obscure to me; it is probably sexual.

Apart from the marginal projections, the male clasper, after having been denuded, appears from outside as a more or less elongate simple flap. In reality it is a flat box. There is a large invagination from the outer surface, the mouth of which is easily overlooked. The central area of the clasper, generally more strongly chitinized, as indicated in the figures by stippling, is somewhat convex and forms the outer wall of the pocket. Below this sclerite is a longitudinal slit, closed in the dry specimens and diagrammatically emphasized in the drawings by a black line. The slit is an outlet rather than an entrance; for the cavity contains a scent-organ and is filled with modified scaling, a large tuft projecting from the base distad consisting of two different types of scales: a transparent scale on a long stalk appears white, and a small more or less elongate-elliptical one is filled with a waxy yellow substance. The scale of the long type (text-figs. 235-237) differ in some of the species. In the American *Utetheisa*, for instance, it is very narrow from the base to three-fifths and then gradually widens, the scale not being unlike an oar with the tip more or less asymmetrical

(text-fig. 235). The stalk and the blade are densely studded with elliptical tubercles, which appear at the lateral margins as small domes. The scale of *semara* is similar, but is much shorter and narrower, and the tubercles are replaced by thin short ridges which are confined to the blade. In *pulchella* (text-fig. 236) the stalk is thinner than in *ornatrix* and devoid of tubercles or ridges; the apex is more abruptly widened, at least one-half broader than in the American species, and bears short ridges; its outline is variable as indicated by text-fig. 236. The scales are alike (or perhaps only very little different) in *pulchelloides*



and *lotrix*, resembling those of *pulchella*, with the apex somewhat broader as a rule, more symmetrical and bearing longer striae, and with the apical margin more distinctly dentate (text-fig. 237, *U. lotrix*). This scent-organ presumably comes into play when the male is hunting for a female. Glands in the clasper occur elsewhere in *Arctiidae*, for instance in *Rhodogastris* Hübner, 1819. I have not studied the organ any further; that should be done with material adequately preserved in a fixative liquid. The resemblance in the clasper and its scent-scales of the Malayan *U. semara* to the American species instead of some Oriental one is surprising, the explanation possibly being that both claspers are of a more ancestral type than the claspers of the other species. The shapes of sternum VII in the females of *semara* and *bella* point the same way.

I know of only one more specific distinction found in both sexes, at least in one species: asymmetrical tarsal claws. The pair of sickles, each with a tooth about the centre, are equal in size and shape in both sexes of *Utetheisa* with the exception of *U. pulchella*, *pulchelloides* and representatives and *U. lotrix*. The asymmetry is very slight in *pulchella* and *pulchelloides* and confined to the male, being more noticeable in the hindtarsus than in the other legs; in *lotrix* it is rather well pronounced in the male and

slight in the female, but also in this sex sufficiently marked for distinguishing under the microscope the females of *pulchella* and *lotrix* by their claws. We find this asymmetry sporadically in other Lepidoptera, the best-known example being the *Acraeinae* butterflies, where it is a male character occurring in most species. In *Utetheisa* and *Acraea* the posterior (or inner) sickle is the longer of the two. The distinction was evidently originally linked with the male sex only and at a later stage appeared in the female *lotrix* as a rudiment, comparable to the glossy coloration of male butterflies being occasionally more or less indicated in the female. The function is no doubt sexual, but why it is the posterior half of the claw that is the longer, whereas in *Rutelid* beetles, for instance, the anterior sickle is the longer, is a mystery to me. The slight asymmetry in the female claw of *lotrix* has probably no function at all; it is a

phylogenetic budding-on, not occasioning any disturbance and therefore not eliminated.

The remaining specific distinctions of the Old World *Utetheisa* are confined to the males and are found in the antenna, the hindwing and the hindleg.

As in Heterocera with pectinated antenna, the female antenna is frequently also pectinate or dentate or serrate, the processes being occasionally (in some Saturnioid *Ceratocampidae*) longer than in the male, I expected to come across some dentate female antenna among the material from localities where the males have fairly long pectinations. All the females, however, I have seen have simple antennae, with the exception of *U. galapagensis*, which shows a short, but noticeable, dentition; the male of this species should, therefore, be expected to have longer pectinations than any other *Utetheisa*, if evolution were bound to follow the demands of human logic. However, it is better to be an agnostic when dealing with nature; prophecies are only quite safe if the wording is sufficiently ambiguous.

The antennae of the males of the two other American species and of *pulchella*, *lotrix* and *semara* are simple, with the usual long cilia and a long bristle (or two). In *elata* the antenna is almost exactly the same as in *pulchella*, but in *cruentata* and *lactea* the segments are shorter and constricted at the base, the sides projecting a little, these rudimentary teeth being best developed in *lactea*. Uniting all the other males with dentated or pectinated antennae under *U. pulchelloides*, with the exception of the African representative *amhara*, the Nicobar species *antennata* and *salomonis*, we find the lateral projections varying from a short tooth to a rather long pectination (text-figs. 249-257) and the distribution of these variations so erratic that it is difficult to decide in the absence of any other structural distinctions whether long, medium and short projections indicate species or subspecies. The question is much complicated by the occurrence, in some localities, of specimens with long and short projections. The only solution of the puzzle I can suggest is based on the habit of migration observed at least in *pulchella*. This African species ranges from the Mediterranean countries to the Mascarene Islands and across Asia to China, Ceylon and Burma. It occurs frequently in Central Europe in favourable years, and is occasionally seen farther north. Its distribution is nearly the same as that of two Ethiopian Hawkmoths, *Acherontia atropos* L. 1758 and *Deilephila nerii* L. 1758. All three are wanderers. Swarms of *U. pulchella* have been seen, and the species has recently managed by some means or other to reach South America, Miss Lucy I. Clarkson as well as the Rev. Arthur Miles Moss having caught and bred it at Pernambuco.

It is hardly far-fetched to assume that also some of the other species are migrants, at least in years favourable for the release of the urge to seek other quarters. If that is the case with one or the other form of *U. pulchelloides*, the occurrence of two of them in the same locality would be explained. That, however, raises another question. Subspecies which differ in no other structure but the male antennae might be expected to interbreed and form a hybrid population. We have from the small island of Guam a short series of males (4 ♂♂, 2 ♀♀) with pectinated antennae, and a larger series (7 ♂♂, 9 ♀♀) with a short dentition instead, and one intermediate ♂ from that place, presumably a hybrid. The dentate form of the male is the only one we have from the Philippines, Hainan, Indo-China and India; our series being very large means that the moth is common in that area and therefore quite likely to travel far

afield and occasionally to reach Guam. Hampson's *pectinata* with long pectinations is based on a single specimen from Port Essington, North Australia. All our Australian males have short teeth instead: but our series from Moa, Tenimber and Key consists of males with long pectinations, suggesting that the Port Essington specimen was an immigrant, probably from Tenimber. A few specimens (Key, Koor) have the antenna subdentate and may be immigrants, possibly from the Moluccas. Another equally long-pectinated form inhabits the Nicobars (*U. antennata*). Males with shorter and broader pectinations are known to me from the Louisiades (south-east of New Guinea), and the Seychelles and Chagos. The males from Tuamotu, Tonga, Ellice and the Marshall Islands, inclusive of Wake Island (and presumably all the more outlying Pacific islands), have dentate antennae, the teeth being broad and prominent. With the exception of the localities mentioned, the area from Ceylon to China and eastwards to Australia and New Guinea has a male with very short and broad teeth which strongly contrast with the pectinations (compare text-figs. 252-254). This widely distributed antenna, nearest to the antenna of *lactea*, was probably the original one from which the male antennae with longer processes developed, the growth of the teeth into pectinations having taken place sporadically and independently.

The inconvenient fact that two *pulchelloides* forms occur together on Guam and Tenimber has above been explained away by referring it to migration. In the absence of the observation of migratory habits in *pulchelloides*—which presupposes that the observer has learnt to distinguish between *pulchelloides*, *lotrix* and *pulchella*—the explanation is at most plausible, because it is based on the assumption that *pulchelloides* possesses the migratory habit known of *pulchella*. The plausibility of the explanation may have misled me to accept it as an easy way out of a difficulty, and I should be wrong if *pulchelloides* did not migrate. I emphasize the point, because I wish to draw attention to the importance of a knowledge of the habits of the species for research in systematics.

I touched above, also in connection with migration, on hybridism between two subspecies found on Guam, and I think there can be no doubt that hybridization occurs also in the subspecies of *pulchella*. This moth is common in North, East and South Africa, but is more rarely found in the West African forest region, being an insect of the open country. It is represented in Angola and Katanga by a conspicuously coloured form described as a distinct species, *U. kallima*, by Swinhoe in 1907. Rothschild 1910 and Hampson 1920 concurred in this opinion. Weymer, on the other hand, described it in 1908 as *U. pulchella completa*, and I agree with him that *kallima* and *pulchella* are subspecies of one and the same insect. The amount of scarlet on the forewing and the black border of the hindwing are not so constant as one might infer from the descriptions of *kallima*, and we have some Palaearctic specimens nearly as scarlet as some of the Angolan ones. Most specimens from the Lake Kivu district, whence we have a good series, and from the region of Lake Tanganyika, approach *U. p. pulchella* and have been described as *U. callima dilutior* Roths. 1910, some examples being similar to the least red Angolan individuals, others coloured like certain specimens of *pulchella pulchella* from Tanganyika Territory and Kenya. The intergradation is complete from extreme *kallima* via *dilutior* to *pulchella*. There being no line of distinction and the area of *dilutior* being adjacent to the areas of *pulchella* and *kallima*, we have every reason to look upon *dilutior* as an indefinite hybrid population.

The area inhabited by the Angolan *U. p. kallima* being quite small as compared with the area in which *U. p. pulchella* is found, one might wonder why *U. pulchella* is here subspecifically modified and nowhere else in its enormous range. An enquiry as to which status *kallima* occupies in the evolution of *U. pulchella* partly clears up the anomaly. As stated on p. 251, the ancestral *Utetheisa* were scarlet and black, the creamy-white pigmentation being a later acquirement. This opinion is supported by the colouring of some crippled *pulchella* from South France in the Tring collection: these specimens, bred and not fully developed, show an amount of red much exceeding the average, approaching *kallima* closely. This points to arrested development of the colouring. Therefore I look upon *pulchella kallima* as an older form than the whiter *pulchella pulchella*; as an Angolan relic in danger of being slowly absorbed at the eastern outskirts of its range by the migratory *pulchella pulchella*, which is a Mediterraneo-Ethiopian modification. A slight difference in the male genitalia of *kallima* is also found in some *dilutior*; other specimens of *dilutior* intergrade with *pulchella* or do not differ.

In the account of the antennae of the forms of *U. pulchelloides* (p. 261) we purposely did not include the males from Africa (*U. amhara*) and the Solomon Islands (*U. salomonis*), because they occupy a special position. The African antenna is like the Indian one, and that of the Solomon male similar to, but in dorsal aspect a little wider than, the antenna of *pulchelloides* from the Seychelles and Chagos. Both moths, however, differ from the other modifications of *pulchelloides* in quite another somatic.

All the males of the various subspecies of *pulchelloides* bear on the hindwing a tuft of long hair projecting from a submedian fold. This scent-organ is a truly secondary sexual male character, which has no equivalent in the female. Besides *pulchelloides* and *antennata* the organ is present only in the Malagassic *elata*, *cruentata* and *lactea*. It is undoubtedly an acquired organ superimposed on the ancestral *Utetheisa* and not correlated with the specific or subspecific distinctions in the genitalia, antennae and coloration, and not of fundamental taxonomic value. A grouping of the species according to the presence or absence of this organ is unnatural, as proved by the forms representing *pulchelloides* in Africa and on the Solomons, New Hebrides and Lifu. If all the species of *Utetheisa* possessed the fold and tuft, I should not hesitate to regard the absence of the organ in the districts mentioned as due to loss. But was the scent-organ really acquired by all species and then lost in the majority of them, the male hindwing having returned to an ancestral state? Or did only the Malagassic species and *pulchelloides* acquire the organ with the exception of the African and Solomon Islands representatives of *pulchelloides*, the hindwing of these exceptional males having retained its original state? Without further evidence one way or the other, one can answer such questions with yes or no according to one's preferences or prejudices. For, though all roads lead to Rome, all lead also away from it. In which direction did the evolution of the scent-organ travel? The starting-point is indicated. The scent-organ is placed in the fold between veins *1a* and *1b*, and the fold is enlarged so as to cover the organ. In all the species without the organ the membrane between *1a* and *1b* is likewise folded, but the fold is simple and can be entirely flattened out. *U. pulchella*, *U. bella* and *ornatrix* and *U. semara* bear in this fold a row of hairs as thin as those of the hairy area extending from *1b* to the cell and base. The "tuft" of the scent-organ has evidently been

formed by a concentration and enlargement of these thin hairs of the *pulchella*-fold. Therefore *pulchella* and the other species mentioned as having this rudiment of the scent-organ must be regarded as more ancestral in respect to this organ than the species with the tuft fully developed. If that is so, which position take the representatives of *U. pulchelloides* which have no scent-organ, but otherwise agree closely with the tuft-bearing forms of it? I have examined 70 males from Africa and 17 from the Solomons, New Hebrides and Lifu, i.e. 174 hindwings altogether, and have found them all devoid of the primitive row of hairs. This complete absence suggests that the hindwing of these two forms is not primitive, but has lost the scent-organ: the two insects are derivations from the tufted *U. pulchelloides*.

Moreover, the African representative of *pulchelloides* is confined to Abyssinia and Northern Somaliland (as far as we know at present), which indicates an extension of the Oriental fauna, i.e. an extension of the range of the tufted *pulchelloides*, which is equivalent to saying that the tuft has been lost. The home of *U. salomonis*, the far-eastern form without tuft, is surrounded by *pulchelloides*-forms in which the tuft is in evidence; *salomonis* differs somewhat in the coloration and in the male antenna from its neighbours, but there is no apparent reason why the male tuft should be absent. One would like to examine the wings in the pupa for vestiges of the tuft. It is of fairly frequent occurrence in Lepidoptera that geographically widely separated species or subspecies have a characteristic in common independently acquired either by accretion or reduction; *U. amhara* (Africa) and *U. salomonis* (Solomons, etc.) are illustrations of this phenomenon.

The last species without a scent-organ on the hindwing of the male is *U. lotrix*. In the specimens from the Oriental region and the Seychelles there is likewise no trace of the primitive row of hairs in the fold, which I interpret as being due to reduction as in the case of the two previous forms. But it is here not the loss of the tuft, but the loss of the primitive row of hairs; the ancestor of *U. lotrix* had no scent-organ on the hindwing. I arrive at this conclusion from the fact that in some African specimens the primitive row of hairs in the fold is present or indicated and that the presence or absence in the Africans seems to be correlated with the degree of development of another type of organ, probably also a scent-organ, situated in the hindleg. In all eastern males this modification of the hindleg is very strongly developed, and the primitive hairs of the fold are absent. In Africa the row of hairs is lost in the examples which have the hindleg more modified than the specimens which have the row preserved; this statement, however, requires confirmation, the number of African males (16) before me not being large enough for an enquiry of this kind. The number of Oriental males in the Tring collection is very large.

The modification of the hindleg of *U. lotrix* above referred to is instructive in more than one way. The leg combines three distinguishing characters confined to the male. The most conspicuous one of them, which catches the eye at once under the microscope, is the peculiar scaling of the inner- and underside of the femur and tibia (text-fig. 255). The scales covering these sides are short, ovate, arranged like flat tiles on a roof, but in less regular rows, contrasting sharply with the longer and rougher scaling of the rest of the leg. The tibia is a little more swollen than in other species; but the swelling is generally less noticeable in the African specimens than in the Oriental ones; both the modified scaling

and the slightly modified tibia depend probably on the degree of development of a gland. However, I have not found the gland. I do not wish to infer that the presence of a gland in the tibia of a moth is inevitably accompanied by this peculiar scaling; far from it. The tile-scales are a special modification of *lotrix*, the meaning of which we do not yet know. We are here on the borderland of correlation.

It is, I think, generally agreed that there are two kinds of specific distinctions: (1) independent distinctions, which are not necessarily affected when other characteristics become modified; and (2) correlated distinctions, which are so bound up each with an independent one that the correlate exists and varies only along with its master character.

In a discussion on the Species Problem at the Linnean Society of London I said that correlation in the different organs was rare.<sup>1</sup> According to Professor W. Robyns's contribution to the discussion<sup>2</sup>: "There is a certain correlation between the different characters of a species or group, so that a few main characters may be recognized, which by itself will bring up some minor characters of secondary value. That seems to be the result of the use of different criteria." I am afraid the word "correlation" is often used in a somewhat loose sense. A specific distinction is either correlated with another distinction or it is not; it is not a matter of opinion, but should be a matter of fact ascertained by the study of variation. For purely diagnostic work, of course, all constant distinctions are on the same level and for the purpose of facilitating the determination of a species an author may seize upon any distinctions he considers most suitable; but in questions of relationship, i.e. evolution, a minute specific may be of much greater importance, because it is an ancestral relic, than a conspicuous distinction acquired at a much later stage in the evolution of the species. It is so easy to sweep away quantitatively small differences as "minor" specifics correlated with "major" ones and therefore "negligible." The status of a specific must be known before it can be used in any argument. More than 40 years ago I came to the conclusion from the study of the genitalia of *Papilio* that "the direction of the variation of the genital armature within a species of *Papilio* is entirely independent of the variation of the wings."<sup>3</sup> I have found no exception in other Lepidoptera, and what I said above about the pattern of *Utetheisa pulchella*, *pulchelloides* and *lotrix* is an affirmation of the statement of 1896. Professor S. Maulik in a paper lately published<sup>4</sup> made a mistake in regarding the inconstant distinctions in the pattern of *U. pulchella* and *lotrix* (cf. p. 225) as correlated with the genitalia. Characters correlated occur together; but characters occurring together are not necessarily correlated. An old barn I saw here in the Chiltern Hills had a hole in the roof and broken windows, and on the floor was a small heap of smashed tiles and splintered wood; three features occurring together. The hole in the roof was caused by beetles having so weakened some laths that these could not support the weight of the tiles and snow, and the broken panes were due to boys who, passing that way and seeing the dilapidated building, had shied stones at the windows, as any normal boy would. Two features originated at different times and by different forces;

<sup>1</sup> *Proc. Linn. Soc. Lond.* 1938, p. 241. On p. 244, line 5 from top, "co-ordination" is printed instead of "correlation."

<sup>2</sup> *Ibid.*, p. 250.

<sup>3</sup> *Nov. Zool.*, iii, p. 499 (1896).

<sup>4</sup> *Ann. Mag. N.H.* (11), iii, p. 232 (1939).

the heap of rubble on the floor, however, was correlated with the hole in the roof, and the solitary unbroken pane was an ancestral character, a relic. All the features were acquired in a process of decay, an evolution downwards. The features of a species also are acquired in a process of evolution. Sometimes correlation is easy to recognize. If in a genus of beetles a species is distinguished by abnormally convex elytra, the interspaces between the rows of punctures are wider than on the normal elytra of other species. And in a species with a tubercle on the elytrum, the interspace bearing the tubercle is widened in that place according to the size of the tubercle. In both cases there are two distinctions, but the presence of one depends entirely on the presence of the other. *U. lotrix* presents us with an interesting illustration of correlation of a less obvious kind. The swollen tibia and the modified scaling are not the only peculiarities of the male hindleg. The two pairs of spurs likewise are more or less different from those of the other species of *Utetheisa*, being often distinctly shortened in the Oriental males of *lotrix*, which all have modified scaling; while in Africa, where the extent of the scale-modification varies, the spurs vary from being normal to being slightly shorter. Swollen hindtibiae carrying a scent-organ are not infrequent among *Geometridae*, the swelling being here accompanied by a reduction in the size of the spurs, which sometimes disappear altogether. This coincidence cannot be fortuitous: the cause of the swelling is the development of a gland, and the swelling causes a reduction of the spurs. It appears to be a matter of growth, the material used for the enlargement of the tibia not being available for the growth of the spurs to the normal size.

TABLE III.

DISTRIBUTION OF CHARACTERS ALIKE AND UNLIKE IN TEN OLD WORLD SPECIES.

	Coloration. ♂♀	Genitalia. ♂♀	Antenna. ♂	Tarsal Claw. ♂♀	Hindwing. ♂	Hindleg. ♂
<i>U. pulchella</i> . .	a	a	a	a	a	a
<i>U. elata</i> . .	b	(a)	a	(a)	l	a
<i>U. cruentata</i> . .	c	(a)	(a)	(a)	l	a
<i>U. lactea</i> . .	d	(a)	(j)	(a)	l	a
<i>U. antennata</i> . .	e	g	j	a	l	a
<i>U. pulchelloides</i> .	a	g	j	a	l	a
<i>U. amhara</i> . .	a	g	j	a	a	a
<i>U. salomonis</i> . .	(a)	(g)	j	a	a	a
<i>U. lotrix</i> . .	a	h	a	k	a	m
<i>U. sumatrana</i> . .	n	h	a	k	a	m
<i>U. semara</i> . .	f	i	a	(a)	a	a

The distinctions constantly present at least in one sex of the species of *Utetheisa* are found in six organs: coloration of wings ♂♀, genitalia ♂♀, antenna ♂ or ♂♀, tarsal claw ♂ or ♂♀, hindwing scent-organ ♂, hindleg ♂. The two American species *bella* and *ornatrix* differ from each other in one specific only, coloration; the two together are distinguished from all the Old World species by two specifics, coloration and genitalia. In the Old World series the lowest species as regards the number of constant specifics peculiar to it alone is *U. pulchella*, which only differs from every other species in a slight modification of



the male genitalia, every other distinction being shared with one or the other species, and *U. lotrix* is the highest, being different from every other species in the genitalia ( $\sigma^{\circ}$ ), the tarsal claw ( $\sigma^{\circ}$ ) and the hindleg ( $\sigma$ ). Designating each of the six distinctions of *U. pulchella* as "a," those of *elata* which differ but slightly as "(a)" and those which differ more strongly as "b," and continuing in the same way with the other species, the preceding table gives an approximately correct survey as to which distinctions are peculiar to a species and which each species shares with one or more of the other species.

*Example.*—*U. semara* differs from *U. pulchella* strongly in the coloration and genitalia, and slightly in the tarsal claw, and agrees with it in the antenna, hindwing (no scent-organ) and hindleg.

Further and more detailed research will show whether the various species are really like *U. pulchella* in the organs represented by "a" in the table. I may have missed minute but constant distinctions.

### SYSTEMATICS.

The genitalia offering the most reliable distinctions in all the species of the genus, we group the species as follows (compare figures on p. 258):

A. **Pulchella** Group. Four species.— $\sigma$ . Clasper (text-figs. 227, 231) dorsally convex, no gap dorsally between the two claspers, or a very narrow one, except basally; dorsal margin more or less corrugate; basi-dorsal process  $P^1$  concealed in a view from outside except its base; no separate process  $P^2$ ; apex ( $P^3$ ) curved downwards.

$\sigma$ . Apical sinus of sternum VII extending forward less than halfway to base of segment; apex of lobes rounded; sides of sternum rather sharply marked, incurved (text-fig. 231).

(a)  $\sigma$ . Basi-dorsal process  $P^1$  of clasper reaching a little beyond the median joint (n) of inside. Hindwing with fold between veins 1a and 1b proximally of middle on upperside, the fold containing a large tuft of yellowish buff stout and long hairs packed closely together in a row.

1. *U. elata*, composed of three subspecies . . . . . p. 268
2. *U. cruentata*. . . . . p. 270
3. *U. lactea*, composed of two subspecies . . . . . p. 271

(b)  $\sigma$ . Basi-dorsal process of clasper reaching to median joint (n) of inside (text-fig. 238). Hindwing without tuft in fold. Tarsal claw slightly asymmetrical.

4. *U. pulchella*, consisting of two subspecies . . . . . p. 272

B. **Pulchelloides** Group. Four species.— $\sigma$ . Clasper (text-figs. 228, 239–242) with two dorsal processes: basal one ( $P^1$ ) directed backward-upward, its apex not concealed; postmedian process ( $P^2$ ) a broad lobe; apical process ( $P^3$ ) curved down; a wide gap between the two claspers below the postmedian lobe (text-fig. 240). On inside the ventral area of clasper with short blackish ridges and at and near ventral margin with blackish bristles. Antenna dentate or pectinate. Tarsal claw slightly asymmetrical.

♀. Groove separating sternum VII (text-fig. 232) from the tergum less defined than in the *pulchella* group; median sinus as in that group or narrower. At least the first ten segments of the antenna about as broad as long or broader.

(c) ♂. Hindwing with scent-organ.

5. *U. antennata* . . . . . p. 278  
 6. *U. pulchelloides*, composed of 8 subspecies . . . . . p. 279

(d) ♂. Hindwing without scent-organ.

7. *U. anhara* sp. nov. . . . . p. 276  
 8. *U. salomonis* . . . . . p. 277

C. **Lotrix** Group. One species.—♂. Claspers dorsally not contiguous (text-figs. 230, 234); with three processes: P<sup>1</sup> broad, entirely visible from outside; P<sup>2</sup> likewise broad, directed distad, below it a sinus separating it from P<sup>3</sup>, which is directed upwards, not downwards as in the previous groups, and is studded with tawny bristles. The ventral area of inside of clasper densely hairy. Anal tergum (text-fig. 229, X.t.) strongly widened downward before apical hook. Hindleg with the tibia more or less swollen and the scaling partially modified into small rounded scales covering each other like tiles (text-fig. 255). Tarsal claw asymmetrical. Hindwing without scent-organ.

♀. Sinus of sternum VII extended to before middle (text-fig. 233); apex of lobes broad, oblique from sinus outward; at base of segment close to tergum a small sharply defined, well-chitinized, round groove concealed under the apical margin of sternum VI. Tarsal claw less asymmetrical than in male.

9. *U. lotrix*, composed of four subspecies . . . . . p. 286  
 10. *U. sumatrana* . . . . . p. 289

D. **Semara** Group. One species.—♂. Clasper narrow (text-fig. 230), the two claspers widely apart dorsally; basal process P<sup>1</sup> long and broad, tongue-shaped; P<sup>2</sup> apical, rounded; P<sup>3</sup> represented by a small projection downward of P<sup>2</sup>; dorsal margin nearly straight in lateral aspect, strongly chitinized, tubular; lateral sclerite (wall of cavity) white, feebly chitinized, glossy; scales in cavity with long narrow blade. Antenna simple. Tarsal claw symmetrical. Hindwing without scent-organ. Anal tergum rounded-widened from before middle to short apical hook.

♀. Sternum VII basally very broad, with large lateral groove (text-fig. 234), the segment swollen at the lateral side of this groove; medium sinus short.

11. *U. semara* . . . . . p. 290

Here would follow the **Bella** Group, containing the two American species *bella* and *ornatrix*, and then *galapagensis* with the antenna of the female dentate.

### 1. *Utetheisa elata* Fabricius 1798.

*Bombyx elata* Fabricius, *Ent. Syst. Suppl.*, p. 440, no. 222-3 (1798) ("in India orientale" falso).

The largest species of the genus. Forewing much more extended black than in other species, with large costal and submarginal red spots; the amount of red and white in basal two-thirds varying individually and subspecifically;

beyond middle a white band, usually large, consisting of a patch in cell, another below it and as a rule a small dot; fringe black, rarely with indications of white dots.—Hindwing white, with black distal border, or the white reduced to a small diffuse patch, with intergradations.

Antenna simple, in male the segments a little more strongly rounded than in *U. pulchella*. Tarsal claw symmetrical.

♂. Median sclerite of clasper much longer than in *U. pulchella*; apical blade of scales in cavity wider than in that species, more like the scales of *U. lotrix* and *U. pulchelloides*.

Neuration of *U. elata*.—No. of wings examined 174.—(a) With areole; vein 10 from areole in 60 per cent.—(b) With areole; vein 10 on short stalk with 8.9 in 31 per cent.—(c) With areole; vein 10 on a long stalk with 8.9 in one wing (0.6 per cent.).—Without areole; vein 10 from 7.8.9 in no wing.—Without areole; vein 10 direct from cell in 9 per cent. Vein 7 more often from areole and more proximal than 10 than in other species, except *lactea*.

*Hab.* Malagassic Subregion and Usambara.

(a) ***U. elata elata*** Fabricius 1798.

*B. e.* Fabr., *l.c.*

*Utetheisa* (!) *venusta* Hübner, *Zutr. Exot. Schm.*, iii, p. 29, figs. 521, 522 (1827-31) ("Martinique" falso, probably slip for Mauritius).

*Euchelia formosa* Boisduval, *Faune Madag.*, p. 85, no. 2 (1833) (Maurice, Bourbon, Madagascar; new name to replace *venusta* Hübn.).

*Utetheisa venusta*, Saalmüller, *Lep. Madag.*, p. 159, no. 336 (1891) ("Ind. S. Afr." falso).

*Deiopeia venusta*, Hampson, *Fauna Brit. Ind., Moths*, ii, p. 55, no. 1280 (1894) (partim; "Sikhim, Sumatra" falso).

*Utetheisa elata*, Hampson, *Lep. Phal.*, iii, p. 480, no. 2084, text-fig. 215 (1901) (Madagascar, Mauritius, Johanna); Strand, *Ann. Soc. Ent. Belg.*, liii, p. 357, no. 2 (1909) (Madagascar: Betsileo, Majunga; Gr. Comoro; Isle de France); *id.*, in Wagner, *Lep. Cat.*, pars 22, p. 360 (1919); Gaede, in Seitz, *Macrolep.*, xiv, p. 93, pl. 12a (1926) (Madagascar).

*Deiopeia diva* Mabille, *Ann. Soc. Ent. Fr.*, 1879, p. 305 (Madagascar).

Basal third of forewing above red marked with black and white.—Hindwing with broad black distal border.

In the abnormally coloured specimen described by Mabille as a distinct species, *diva* (in the Brit. Mus. ex coll. Oberthür), the red marginal and submarginal spots are small and the others are replaced by white slightly shaded with red, the forewing appears at first sight black patched and marmorated with white; hindwing with the black border extending to apex of cell, abdominal area shaded with black. Mabille lays much stress on the presence of an additional dot at the apex of the forewing; this dot, but small, is marked in one of our specimens (♀) from Réunion in which the white borders to the red spots are rather more conspicuous than is usual.

*Hab.* Madagascar; Bourbon; Mauritius.

In the Rothschild collection from Madagascar: Morondawa; Mahanoro, Ambinanindrano; Lac Aloatra, Imerinandrosa; Antsihanaka; Perinet, Forêt d'Anamalazotra; Baie d'Antongil; "Madagascar"; 15 ♂♂, 30 ♀♀.—Réunion, 10 ♂♂, 4 ♀♀.—Mauritius, 7 ♂♂, 5 ♀♀.—Comoro Is.: Anjouan, 6 ♂♂, 5 ♀♀.

Specimens from Mauritius and Bourbon have on the underside of the forewing frequently more scarlet in the centre.

*(b) U. elata fatela* subsp. nov.

*Utetheisa elata*, Fletcher, *Trans. Linn. Soc. Lond.*, xiii, p. 270 (1910) (liter. excepted; Mahé).  
*Utetheisa elata* ab. *diva*, l.c. (err. determ.).

♀. Forewing, upperside: the red markings near base and on disk much reduced in size and number; costal and submarginal red spots about the same size as in *U. e. elata*; beyond middle an oblique white band composed of two patches and a dot, partially and slightly bordered with red.—Hindwing suffused with black (type), nearly in middle a suffused white spot or patch; sometimes the hindwing white, but the black border broader than in *U. e. elata*, about as broad as in ab. *diva*.

On underside the hindwing white to apex of cell.

Upperside of abdomen suffused with black.

*Hab.* Seychelles.

In the Rothschild collection from Mahé, Cascade, 1 ♀; in the Brit. Mus. a small series of ♀♀ from the same place; specimens with the white on hindwing extended from Barbarons, west side of the island.

A very interesting form, connecting *elata* with *fatua*.

*(c) U. elata fatua* Heyn. 1906.

*Deilemera fatua* Heyn, *Ent. Zeits. Guben*, xix, p. 213, text-fig. (1906) (Usambara, type in Berlin Mus.).  
*Utetheisa fatua*, Strand, *Ann. Soc. Ent. Belg.*, liii, p. 356 (1909) (Usambara: Sigi, Derema, Amani, ix-xi, i, iii), and *ibid.* ab. *devittata* and ab. *mediomaculata*; *id.*, in Wagner, *Lep. Cat.*, pars 22, p. 360 (1919).

*Utethesia* (!) *fatua*, Hampson, *Lep. Phal. Suppl.*, ii, p. 2084b, pl. 68, fig. 15 ♀ (1920) (Magila; "Zanzibar" falso?).

*Utetheisa fatua*, Gaede, in Seitz, *Macrolep.*, xiv, p. 93, pl. 13d (1926).

Forewing above with red costal and submarginal spots as in *fatela*, no red on disk, only occasionally some red scaling at the margins of the white band, usually the margins of this band buff or tawny; the band variable, being sometimes much reduced.

*Hab.* Usambara.

In the Rothschild collection from Usambara, 1 ♂, 4 ♀♀.

2. *Utetheisa cruentata* Butler 1881.

*Deiopeia cruentata* Butler, *Illustr. Het. Brit. Mus.*, v, p. 38, pl. 86, fig. 10 (1881) (Mauritius; "North India" falso).

*Deiopeia venusta*, Hampson (error determ.), *Fauna Brit. Ind., Moths*, ii, p. 55, no. 1280 (1894).

*Utetheisa cruentata*, Hampson, *Lep. Phal.*, iii, p. 481, no. 2085 (1901) (Mauritius; "locality Sikkim for this species erroneous"); Strand, in Wagner, *Lep. Cat.*, pars 22, p. 359 (1919); Gaede, in Seitz, *Macrolep.*, xiv, p. 93, pl. 12b (1926).

Forewing above: the black of a dull olivaceous tint, the white markings of *U. elata* replaced by dull buff; the black distal marginal area broken up into spots.—Hindwing white, with black distal border which does not quite reach to near anal angle as in *U. elata*; sometimes a small discocellular spot present, which evidently does not occur in *U. elata*.

Segments of male antenna more convex at sides than in *U. elata*, rudimentary teeth being indicated.

Sternum VII of female with black spot in middle as in *U. elata*.

*Hab.* Mauritius.

In the Rothschild collection 1 ♂, 5 ♀♀.

### 3. *Utetheisa lactea* Butler 1884.

*Deiopcia lactea* Butler, *Rept. Zool. Colls. Alert*, p. 577 (1884) (Providence).

*Utetheisa lactea*, Hampson, *Lep. Phal.*, iii, p. 482, no. 2086, p. 50, fig. 6 (1901) (Providence); Fletcher, *Trans. Linn. Soc. Lond.*, xiii, 2, p. 268 (1910) (variability discussed); Strand, in Wagner, *Lep. Cat.*, pars 22, p. 360 (1919) (Fletcher's article missed and in consequence two new names introduced); Gaede, in Seitz, *Macrolep.*, xiv, p. 93, pl. 12<sup>b</sup> (1926).

In size like smallish *U. pulchella*. Forewing above varying from being similar to that of *U. pulchella* to being almost devoid of black and red spots; black distal marginal line broken up into dots; fringe entirely white.—Black distal margin of hindwing broad only at apex, very narrow or absent from about middle; no discocellular bar.

Segments of median third of male antenna distinctly subdentate, broader than long in ventral aspect.

*Hab.* Islands north and south of the 10° S. Lat. between Madagascar and the Comoros in the south-west and the Amirantes in the north-east.

A most interesting species with a very restricted area. It is a dwarfed branch of the same stock from which arose *U. cruentata* and *U. elata*. Its great variability is partly individual and partly geographical according to the very valuable detailed account given of the species by T. Bainbrigge Fletcher, *l.c.*, and it appears to me probable that another expedition to these islands will not only confirm that the coloration of the species is in flux, but also prove that the distribution of the colour-varieties is unstable. However, in systematics we can only go by what we know, and the facts presented by Bainbrigge Fletcher seem to me to indicate that there are two subspecies, one fairly constant and restricted to Aldabra, and the other very variable and distributed over a number of islands, sometimes a particular colour-form being dominant on an island.

#### (a) *U. lactea aldabrensis* Fletcher 1910.

*U. lactea aldabrensis* Fletcher, *Trans. Linn. Soc. Lond.*, xiii, p. 268 (1910) (Aldabra); Hampson, *Lep. Phal. Suppl.*, ii, p. 510, sub no. 2086 (1910) (Aldabra; "Assumption" not this subspecies according to Bainbrigge Fletcher).

*Utetheisa lactea* var. *aldabrae* Strand, in Wagner, *Lep. Cat.*, pars 22, p. 361 (1919).

Similar in aspect to *U. pulchella pulchella*; fringe of forewing white.

*Hab.* Aldabra.

In the Rothschild collection 1 ♂, 1 ♀; several specimens in the Brit. Mus.

#### (b) *U. lactea lactea* Butler 1884.

*U. l.* Butler, *l.c.* (Providence).

*U. lactea lactea*, Fletcher, *l.c.*; Hampson, *Lep. Phal. Suppl.*, ii, p. 510 (1920).

Bainbrigge Fletcher distinguishes three varieties according to the colour of the forewing:

(b<sup>1</sup>) Form *lactea* Butler 1884.—Scarlet spots absent, black spots much reduced, often nearly entirely absent.—On all the islands except Aldabra.

(b<sup>2</sup>) Form *nigrosignata* Fletcher, *l.c.*—The black spots of the usual *pulchella* pattern preserved; no scarlet spots.—Predominant on South Providence.

(b<sup>3</sup>) Form *rubrosignata* Fletcher, *l.c.*; var. *assumptionis* Strand, *l.c.*—Black markings reduced, scarlet spots enlarged.—Rather sparingly with form

*lactea* on Farquhar and S. Providence; appears quite to replace form *lactea* on Gloriosa and Assumption.

*Hab.* Assumption, Cerf, Farquehar, Gloriosa, S. Province.

In the Rothschild collection f. *lactea*, 1 ♂ kindly presented by T. Bainbrigge Fletcher; f. *nigrosignata*, 1 ♂ from Cerf Is.; f. *rubrosignata*, 1 ♂, 1 ♀ from Gloriosa and Farquhar.

*F. rubrosignata* is what Staudinger used to call "var. et ab.," the distinctive character occurring in a small percentage of specimens in one locality and in the whole population in another district. Such cases require close scrutiny based on large material.

#### 4. *Utetheisa pulchella* L. 1758 (text-figs. 226, 227, 231, 238).

*Phalaena Tinea pulchella* Linnaeus, *Syst. Nat.*, ed. x, p. 534, no. 228 (1758) (in Europa australi, Mauritania).

The Mauretanian insects received by Linnaeus from Brander came from the neighbourhood of Alger; therefore I regard Alger as "terra typica" for *pulchella*, Linnaeus's additional locality "Europa australis" being too vague.

Upperside of forewing speckled with black and scarlet on a creamy-white ground; very variable, sometimes the black, sometimes the red reduced or increased; in most specimens a black dash at base behind cell; the last two black marginal dots rarely more elongate than the dots in front of them.—Hindwing with a black distal border of variable width; most specimens with black discocellular spot.

On underside the area of forewing between cell and hindmargin with pale scarlet markings; the black discocellular bar of forewing well separated from the black discal band, only in 4 per cent. connected with it.

♂. Antenna simple, at least the distal segments longer than broad, the sides of the segments more rounded than in female, but not enlarged into a tooth. Lateral sclerite of clasper not much longer than broad, anteriorly broadly connected with the dorsal chitinized area. Widened apex of long scales in pocket of clasper usually asymmetrical.

♀. While the ♂ is easy to distinguish from similarly coloured specimens of *U. pulchelloides* and its African representative *U. amhara*, the separation of the females requires sometimes closer inspection.

Neuration (cf. p. 254, text-fig. 226, p. 255) as variable as in other species of *Utetheisa*, but the proportions of the different modifications of the subcostal system of the forewing deviate remarkably from those found elsewhere in the genus. Whereas in *U. lotrix* and *U. pulchelloides* vein 10 arises from the areole in over 50 per cent. of the forewings, the figure is 11 per cent. in *U. pulchella*; and whereas in the former two species 10 is on a long stalk with 8.9 in 2–4 per cent. of the wings, the figure in *U. pulchella* is 46 per cent. See Table II on p. 256. In a very small number of specimens (2 per cent.) 10 arises direct from the cell and is usually more proximal than 7.

Although the specimens of *U. pulchella* from Tropical Africa are not sub-specifically separable from Palaearctic *pulchella*, with the exception of *U. p. kallima*, the populations are by no means identical, as shown in Table IV, in which 400 Mediterranean wings taken from the collection at random are compared with 400 wings of Tropical African *pulchella* and 80 of *U. p. kallima* (all we have at Tring from Angola).

TABLE IV.  
NEURATION OF *U. PULCHELLA*.

	<i>U. p. pulchella</i> , Mediterranean.	<i>U. p. pulchella</i> , Tropical Africa.	<i>U. p. kallima</i> .
Number of wings . . . . .	400	400	80
With areole :			
(a) Vein 10 from areole . . . . .	8%	15%	10%
(b) Vein 10 on a short stalk with 8.9 . . . . .	34%	49%	33%
(c) Vein 10 on a long stalk with 8.9 . . . . .	32%	26%	51%
Without areole :			
(d) Vein 10 from 7.8.9 . . . . .	23%	9%	5%
(e) Vein 10 direct from cell . . . . .	3%	1%	1%

The long stalk of category (c) and (d) being mostly due to the reduction of the areole, the two modifications are separated but by a very short step in the individual development and may be counted as one. In that case Mediterranean *pulchella* with the percentages 8, 34, 55 and 3 agrees very closely with *kallima*, whereas Tropical African *pulchella* differs in the high percentage of (b) and the low percentage of (c) + (d).

*Hab.* Southern districts of Central Europe south- and eastward to the Malagassic Subregion, Burma and China, farther north as a migrant; recent arrival at Pernambuco, Brazil.

The records of *U. pulchella* from outside the Palaearctic Region must be discarded: those from India and Ceylon refer to *pulchella* or *pulchelloides* or *lotrix*; those from farther east than Burma refer to *pulchelloides*, *lotrix* or *salomonis*; records from Tropical Africa refer to *pulchella*, *amhara* or *lotrix lepida*. Moore, *Lep. Ceyl.*, ii, p. 104, fig. 5, represents a form of *U. pulchelloides* ("antenna very finely pectinated"), and Hampson's text-fig. 28 in *Fauna Brit. Ind.*, *Moths*, ii, p. 55, is evidently the same insect.

Three subspecies :

(a) ***U. pulchella pulchella*** L. 1758 (text-figs. 226, 227, 231, 238).

*Phalaena Tinea pulchella* Linnaeus, *l.c.*

*Noctua pulchra* Denis & Schiffermüller, *Syst. Verz. Wien*, p. 68, no. 9 (1775) (*pulchella* renamed).

*Bombix pulchella*, Fabricius, *Syst. Ent.*, p. 586, no. 102 (1775) (partim).

*Lithosia amabilis* Trost, *Klein. Beytr. Entom.*, p. 63 (1801).

*Lithosia pulchella*, Haworth, *Lep. Brit.*, p. 150, no. 11 (1809) (York; "Georgia" falso).

*Eyprepia pulchra*, Ochsenheimer, *Schmett. Europ.*, iii, p. 304 (1810).

*Uteheisa pulchra*, Hübner, *Verz. bek. Schm.*, p. 168, no. 1733 (1819).

*Deiopeia pulchra*, Curtis, *Brit. Ent.*, iv, pl. 169 (1827).

*Euchelia pulchra*, Boisduval, *Index Meth.*, p. 39 (1829) (partim).

*Deiopeia pulchella* var. *candida* Butler, *Trans. Ent. Soc. Lond.*, p. 361 (1877) (Congo, South Africa (type), Natal, Cape).

*Deiopeia thyter* Butler, *l.c.*, p. 361 (1877) (Turkey, Punjab (type)).

*Deiopia* (!) *pulchella*, Hampson, *Fauna Brit. Ind.*, ii, p. 55 (1894) (partim; text-fig. 28 alia spec.).

*Uteheisa pulchella*, Hampson, *Lep. Phal.*, iii, p. 482, no. 2088 (1901) (partim; text-fig. 217 alia spec.); Strand, in Wagner, *Lep. Cat.*, pars 22, p. 362 (1919) (partim).

*Uteheisa pulchella* v. (ab.) *pallida* Spuler, *Schmett. Europ.*, ii, p. 143 (1906) (prevalent in S.W. Germany).

*Uteheisa pulchella* ab. *fasciata* Spuler, *l.c.* (locality not specified).

*Uteheisa pulchella* ab. *semisignata* Spuler, *l.c.* (locality not specified).

*Uteheisa pulchella* ab. *melampyga* Spuler, *l.c.* (Dalmatia, — Discoloured ?).

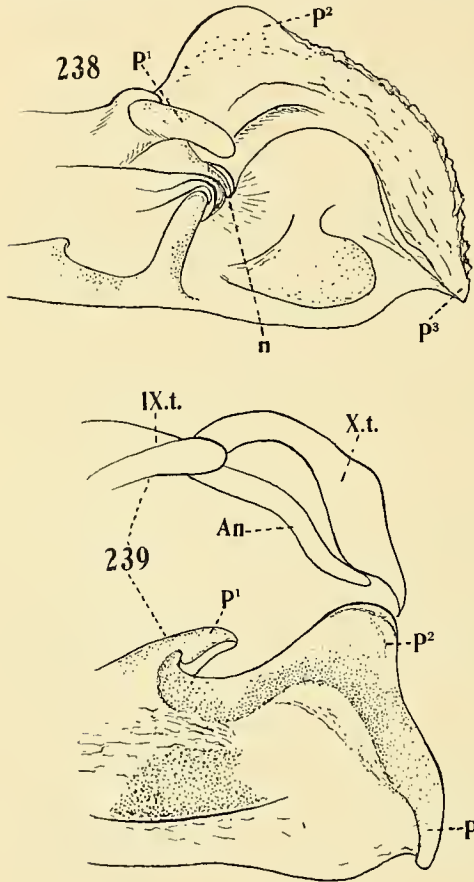
*Deiopeja* (!) *pulchella-bicolor* Oberthür, *Lép. Comp.*, v, i, p. 182 (1911) (Biskra).

*Deiopeia pulchella-bicolor* Oberthür, *l.c.*, p. 335, pl. 82, figs. 764, 765 (1911) (Biskra).

*Deiopeia pulchella-arcuata* Oberthür, *l.c.*, p. 335, pl. 82, fig. 766 (1911) (Ain Draham).

*Deiopeia pulchella* ab. *flava* Bang-Haas, *Horae Macrolep.*, i, p. 58 (1927) (Darjiling. — This species ?  
More probably *U. lotrix*).

The coloration of this Palaearctic-Ethiopian subspecies varies considerably in the proportional development of black, white and scarlet. Extreme modifications are more often observed in Europe and North Africa than in Tropical Africa, which is probably due to collectors in the former areas rearing larger numbers of specimens than collectors in the Tropics. The neuration is likewise very variable, but its variability does not affect that of the coloration. For instance, in 13 Mediterranean specimens with little or no black on the upperside of the forewing I found nearly all the same modifications in the neuration as in 13 Mediterranean examples with the black dots strongly developed. Vein 10 from areole or on a short or a long stalk with 8.9, more proximal or more distal than 7; if the areole is absent, 10 arises direct from cell or from 7.8.9, etc. As such distinctions are generally used for the diagnoses of genera, while differences in coloration are as a rule considered at most as of specific value, we may well ask why only individual deviations from the average colouring of *U. pulchella* have been emphasized by "names." It is tradition, I think. Lepidoptera having been contemplated with the naked eye, or at most been studied with a



hand-lens till recent times, the results of the old method loom very large in the Catalogues and keep the method dominant. In research on behaviour and external adaptation to the environment the picture presented to the naked eye is certainly of paramount importance; but evolution may have made the picture so deceptive as to mislead both the insectivore and the systematist. There is no *a priori* reason why colour should be given preference in systematics. Reliability should be the criterium. Hampson's action (*Lep. Phal. Suppl.*, ii, pp. 195, 220 (1920)) in placing names of species or subspecies "described on differences in genitalia only" as synonyms is based on a queer misconception on the part of an author who had such great faith in the constancy of another morphological character, neuration, that he relied on it implicitly. If the lepidopterist requires "names" for colour-forms, he should also require them for neuration-forms (and the modifications of any other variable organ), the system of naming leading



to a diagnosis of this sort : *U. p. pulchella* ab. *areolata quadrifida septima-proxima bicolor*. Each word after "ab." is a descriptive term and should be treated as a term, not as a name.

It is interesting to note that the most persistent black markings of the forewing are the marginal dots and, on the underside, the discal band. The black marginal band of the hindwing is sometimes broader than usual and occasionally includes a white spot homologous with the median sinus of the normal border ; black discocellular spot often absent, but not in examples with the black spots of the forewing strongly developed. Some specimens have a small diffuse red costal patch on the underside of the hindwing.

*Hab.* Palaearctic and Ethiopia Regions, extending eastward to Burma.

In the Rothschild collection some 1,100 specimens from : Palaearctic Region (with the exception of the northern districts, East Siberia and Japan) ; Ethiopian Region : Sierra Leone, Gold Coast, Nigeria (various places from Kano to the Niger Delta), Cameroon, Kassai, Uganda, Kenya, Tanganyika Territory, Nyasaland, Transvaal, Union of S. Africa, Southern Angola, Comoro Is., Madagascar, Mauritius ; Oriental Region (only 15 specimens) : Ceylon, Cochin, Nilgiris, Bangalore, Madras, Kulu, Sikhim, Silhet, Toungoo (Burma), Shan States.

(b) *U. pulchella dilutior* Rothschild 1910.

*Utetheisa callima dilutior* Rothschild, *Nov. Zool.*, xvii, p. 182, no. 50 (1910) (Lake Kivu, type ; "Germ. East Africa" : Urundi, Mpwapwa, Kilimanjaro ; Nyasaland : Ft. Johnston) ; *id. l.c.*, xviii, pl. 6, fig. 29 (1911) (paratype, ♀).

*Utetheisa kallima* v. *dilutior*, Strand, in Wagner, *Lep. Cat.*, pars 22, p. 360 (1919).

*Utetheisa kallima* subsp. *dilutior*, Hampson, *Lep. Phal. Suppl.*, ii, p. 512 (1920) (Katanga, Lake Kivu).

Probably a hybrid population, intergrading with *U. p. pulchella* and *U. p. kallima*, there being neither geographical nor morphological definite boundaries. Cf. p. 262. In most specimens there is more scarlet on the forewing above and below than in the majority of *U. p. pulchella*. In some the scarlet transverse bands are complete, there being no white in the cell except the rings of the black spots. Such examples agree closely with *U. p. kallima* or are identical with it. Similar specimens are found among *U. pulchella*, but very rarely. In the type specimen the black border of the hindwing broad. Very unsatisfactory as a subspecies and perhaps better united with *U. p. pulchella*.

*Hab.* Districts bordering on Eastern Angola.

In the Rothschild collection a fairly large series from Kissenyi, Lake Kivu ; Urundi and other inland places of Tanganyika Territory ; Nyasaland.

(c) *U. pulchella kallima* Swinhoe 1907.

*Utethesia* (!) *kallima* Swinhoe, *Ann. Mag. N.H.* (7), xix, p. 202 (1907) (Angola).

*Utetheisa pulchella completa* Weymer, *Deuts. Ent. Zeits.*, p. 731 (1908) (Benguela).

*Utetheisa callima*, Rothschild, *Nov. Zool.*, xviii, pl. 6, fig. 30 (1911) ; Hamp., *Lep. Phal. Suppl.*, ii, p. 512 (1920) (Angola, type).

*Utetheisa pulchella* subsp. *completa*, Hampson, *l.c.*, p. 512 (1920) (Angola).

Cf. p. 262. The scarlet bands of forewing above and below complete, only the fourth very narrowly interrupted above by a short creamy streak below middle ; the narrow interspace between the sixth and seventh bands more or

less completely creamy.—Black border of hindwing broad, of nearly uniform width; fringe completely (or nearly) sooty black; in one of the specimens from the Cuanza valley the border as in *U. p. pulchella* sinuate in middle and more deeply in submedian fold, the long scales of the fringe white as in *dilutior* and *pulchella*; in a second example from the same district the lower sinus is represented by a white spot in the black border; 13 other specimens from that locality are normal *kallima*. Our two examples from Katanga have the border bisinuate and the fringe pale.

*Hab.* Angola and Katanga.

In the Rothschild collection 40 specimens from the interior of Angola; several places in the Quanza Valley, and Bihé, Bailundu, Cubal R.; 2 from Katanga, Congo Belge.

##### 5. *Utetheisa amhara* spec. nov. (text-figs. 239-241).

Probably in collections as *U. pulchella*.

The African representative of *U. pulchelloides*. Antenna of ♂ dentate, genitalia similar to those of *U. pulchelloides*; sinus of sternum VII of ♀ broader; hindwing of ♂ without tuft of hairs.

Most specimens larger than Indo-Malayan *U. pulchelloides*, but some quite small. No constant distinction in coloration from *U. pulchella* and *U. pulchelloides*. Black and scarlet spots of upperside generally small; black basal dash before hindmargin thin and incomplete and mostly absent; posterior marginal spots small in almost every specimen; the scarlet spots not confluent to form transverse bands in any of our specimens; on underside no scarlet between cell and hind-margin (but the spots of the upperside shining through), and the black discocellular bar nearly always separated from the black discal band, whereas in Oriental *pulchelloides* they are rarely completely separated; cf. Table I on p. 253.—Black margin of hindwing narrower in most specimens than in *U. pulchella*; discocellular spots mostly absent or small, rarely the two spots connected.

♂. Segments of antenna somewhat broader than long, except a few distal ones, rather strongly constricted at base, triangular in ventral aspect, apical lateral projection short, but distinct, very little more prominent than in Indo-Malayan *U. pulchelloides* with dentate antenna. Clasper (text-fig. 239) as in *U. pulchelloides*, process P<sup>2</sup> somewhat larger; anal tergum (X.t.) broader before apical hook. Tarsal claw slightly asymmetrical.

♀. Sinus of sternum VII somewhat shorter and broader than in *U. pulchella*, much broader than in *U. pulchelloides*, about twice as long as broad in middle.

Occurs together with *U. p. pulchella* and *U. lotrix lepida*; the male is easily distinguished from both by the antenna and clasper, and the female differs much from *lepida* in sternum VII; but the separation of the females of *pulchella* and *amhara* is not always easy, if the abdomen is much compressed.

*Hab.* Abyssinia and northern districts of Somaliland; Kenya (migrant?).

In the Rothschild collection 170 specimens from Somaliland: Dubar; Abyssinia: Harar, Diré Daoua, Kumbi, Hauash R. west of Addis Abeba; Cheren in Eritraea; Sokoke near coast of Kenya (1 ♂).

6. *Utetheisa salomonis* Rothschild 1910 (text-fig. 242).

*Utetheisa pulchella* ab. 4, Hampson, *Lep. Phal.*, iii, p. 484 (1901) (New Hebrides, Solomons).

*Utetheisa pulchelloides salomonis* Rothschild, *Nov. Zool.*, xvii, p. 181 (1910) (Solomons: Guadalcanar and Guizo).

*Utetheisa pectinata ruberrima* Rothschild, *l.c.*, p. 182, no. 49 (1910) (Loyalty Is.); *id.*, in Seitz, *Macrolep.*, x, p. 260, pl. 13k (1914) (Friendship Is. falso).

*Utetheisa lotrix salomonis* Rothschild, in Seitz, *Macrolep.*, x, p. 260, pl. 24g (1914).

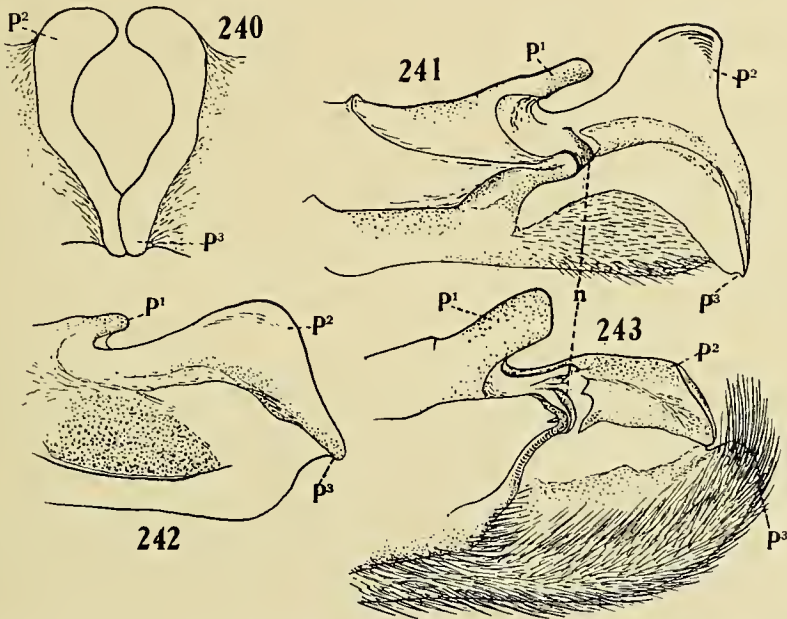
*Utetheisa lotrix* var. *salomonis*, Strand, in Wagner, *Lep. Cat.*, pars 22, p. 361 (1919) (Solomons, New Hebrides).

*Utetheisa pectinata* var. *ruberrima*, Strand, *l.c.*, p. 362 (1919) (Freundschaftsinseln falso).

*Utetheisa pulchelloides* from *salomonis* (!), Hampson, *l.c.*, p. 511 (1920).

*Utetheisa pectinata* subsp. *ruberrima*, Hampson, *Lep. Phal. Suppl.*, ii, p. 510 (1920).

As in *U. amhara* the ♂ without tuft on hindwing. Coloration very variable, but the black of fore- and hindwing much more extended than in any specimen



of *U. amhara*. On forewing, above, the black dots of one or the other row united to form a band, in type (from Guadalcanar; the specimen figured in Seitz is a paratype) the fifth band exceptionally broad, also the third band; the other extreme is represented by some specimens in which the black dots are nearly all isolated; the posterior two marginal spots elongate, mostly confluent, and a basal black dash present in front of hindmargin in all our specimens.—Black border of hindwing broad, sinuate in middle or the posterior portion of the border connected on the discal side with the anterior portion, the bottom of the sinus being isolated as a white spot within the black border; this is the case in about 25 per cent. of our Solomon Island specimens and in the 7 from the Loyalty Islands and New Hebrides.

On the underside of the forewing the discocellular black bar is nearly always united or connected with the discal band.

More variable in pattern of forewing than an equal number of specimens of any other Old World subspecies collected at random, perhaps with the exception of *U. lactea*; the black bands of some specimens very conspicuous. In most

males there is an interesting anomaly in the antenna : in pectinated or dentated antennae the projections of the outer side, i.e. those towards the wing, are longer than those on the inner side. In nearly all males from the Solomons the proximal segments up to the 7th or 8th are an exception. This anomaly is also not rare in the subspecies of *U. pulchelloides*, the direction of development being unstable (outside influence on the pupa ?).

Our two specimens (♀♀) from New Britain are small and not in perfect condition as regards colouring ; in one the black spots of row 4 are merged together, forming a regular line which is angulate at the lower angle of cell spots of row 6 likewise confluent ; in the second specimen the spots are nearly all separate. In both examples the black border of the hindwing with deep median sinus. The specimens fit fairly well into the Solomon Islands series.

♂. Antenna strongly dentate, the projections shorter and broader than in *U. pulchelloides pectinata*, much longer than in *U. pulchelloides papuana* and but little larger than in *U. p. marshallorum*. Claw of tarsus slightly asymmetrical. Process P<sup>2</sup> of clasper broad and the sinus at its distal side almost effaced (text-fig. 242), therefore P<sup>2</sup> as such posteriorly not defined. Hindwing without fold and tuft.

♀. Apparently no structural difference from *U. pulchelloides* ♀♀.

*Hab.* Loyalty Is., New Hebrides, Solomon Is. and New Britain.

In the Rothschild collection from Loyalty Is. : Lifu, 1 ♂, Maré, 1 ♂ ; Solomon Is. : Guadalcanar, 12 ♂♂, 4 ♀♀, Guizo, 3 ♂♂, 1 ♀ ; New Britain : Telesea, 2 ♀♀.

In the B.M. 3 ♂♂, 2 ♀♀ from the New Hebrides.

### 7. *Utetheisa antennata* Swinhoe 1893.

*Deiopeia antennata* Swinhoe, *Ann. Mag. N.H.* (6), xii, p. 215 (1893) (Camorta, Nicobars, 3 ♂♂, 1 ♀). *Utetheisa antennata*, Hampson, *Lep. Phal.*, iii, p. 482, no. 2087, text-fig. 216 ♂ (1901) ; *id.*, *Ann. Mag. N.H.* (7), xix, p. 239, sub no. 2086a (1907) ; Roths., in Seitz, *Macrolep.*, x, p. 260, pl. 13k (1914) ; Strand, in Wagner, *Lep. Cat.*, pars 22, p. 358 (1919).

Placed by Hampson, *l.c.*, into his section II without tuft and fold on the hindwing of the male ; he probably examined at that time only the type specimen, in which the tuft is concealed in the fold, as it often also is in *U. pulchelloides* ; he corrected the mistake in 1907, *l.c.*

Structurally not different from the subspecies of *U. pulchelloides* which have pectinated antennae, but much modified in coloration. Counting the black dots near base as first row, the sixth row of forewing absent, the submarginal area occupied by a broadish pale scarlet band, and the fourth row strongly angulate at vein 6.—Black marginal border of hindwing reduced to a line from before middle, not reaching anal angle and devoid of a distinct enlargement behind lower median vein.

On underside the forewing devoid of the black postdiscal band, which is always present in the *U. pulchelloides*.

*Hab.* Nicobars : Camorta.

Not represented in the Rothschild collection ; but in the B.M. 2 ♂♂, 1 ♀ (inclusive of type ♂ and paratype ♀).

Table V gives a survey of the neuration of the various subspecies of *U. pulchelloides*. For comparison we have added the percentages of the two allied species *U. amhara* and *U. salomonis*, which were already given in Table II.

*U. antennata* is left out, because only 3 specimens are known, of which but one is before me. The number of wings of several subspecies is much too small to give fairly reliable results. The subspecies are arranged according to the length of the dentition of the male antennae, as far as possible. It will be noticed that the two subspecies *umata* and *pectinata* with the longest dentition do not agree in the percentages of the various modifications of the subcostal venation, whereas *pectinata* agrees very closely with its geographical neighbour, the Australian population of *vaga* with very short teeth.

TABLE V.  
NEURATION OF *U. PULCHELLA* AND ALLIED SPECIES WITH DENTATE MALE ANTENNAE.

	<i>U. amhara</i> , Africa.	<i>U. salomonis</i> , Solomons, etc.	<i>U. p. umata</i> , Guam.	<i>U. p. pectinata</i> , Is. of Arafura Sea.	<i>U. p. pulchelloides</i> , Chagos, Seychelles, etc.	<i>U. p. aphanis</i> , Louis- ades, etc.	<i>U. p. marshal- lorum</i> , Pacific Is.	<i>U. p. darwini</i> , Keeling Is.	<i>U. p. papuana</i> , New Guinea.	<i>U. p. vaga</i> , Austra- lia.	<i>U. p. vaga</i> , Indo- Malaya.
Number of wings	378	56	12	80	38	20	62	24	80	34	400
With areole :											
Vein 10 from areole . . .	56%	75%	25%	76%	26%	50%	56%	79%	52%	77%	51%
Vein 10 on a short stalk with 8.9 . . .	29%	21%	67%	17%	50%	50%	26%	17%	40%	23%	40%
Vein 10 on a longstalk with 8.9 . . .	1%	2%	8%	0%	5%	0%	3%	0%	3%	0%	4%
Without areole :											
Vein 10 stalked with 7.8.9 . . .	2%	0%	0%	2%	8%	0%	0%	0%	1%	0%	2%
Vein 10 direct from cell . . .	12%	2%	0%	5%	11%	0%	15%	4%	4%	0%	3%

8. *Utetheisa pulchelloides* Hampson 1907 (text-figs. 228, 232, 244-254).

*Utetheisa pulchella*, Hampson, *Lep. Phal.*, iii, p. 483, no. 2088, text-fig. 217 (1901) (partim).

*Utetheisa pulchelloides* Hampson, *Ann. Mag. N.H.* (7), xix, p. 239 (1907) (partim ; type from Chagos Is.: Peros Banhos) ; *id.*, *Lep. Phal. Suppl.*, ii, 510 (1920) (partim).

*Utetheisa lotrix*, Rothschild (err. determ.), in Seitz, *Macrolep.*, x, p. 260 (1914) (partim) ; Strand, in Wagner, *Lep. Cat.*, pars 22, p. 361 (1919) (partim).

We unite under this name all the forms with dentate or pectinate male antennae, with the exception of *U. antennata*, which is distinguished by the reduction of the black markings, and *U. salomonis* and *U. amhara* differing chiefly in the loss of the scent-organ of the male hindwing. These two exceptional populations are likewise modifications of the *pulchelloides*-type, but are here treated as distinct species for the sake of simplifying the rather involved systematics of this group of *Utetheisa* and because there is an easily recognized definite gap between them and *pulchelloides*.

Base of forewing with a dash behind 1a, with very rare exceptions, and posterior two marginal spots elongate in a very large percentage of specimens.

On the underside the black discocellular bar of the forewing nearly always connected or more or less completely united with the black discal band ; see p. 253.

Most specimens small, but many fully as large as *U. pulchella* : length of forewing 12-21 mm.

For genitalia, see p. 267. External median sclerite of clasper elongate; the apex of the scales inside the pocket broad, more symmetrical than in *U. pulchella*. The sinus of sternum VII of ♀ short (text-fig. 232, on p. 258), varying in width.

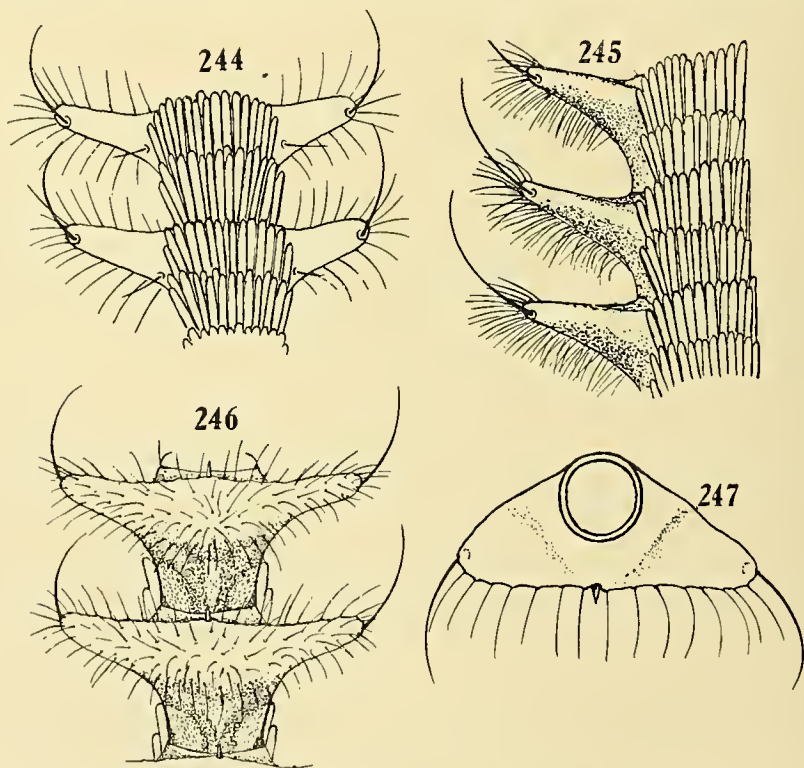
*Hab.* The species occupies the whole of the Oriental Region (perhaps with the exception of the southern districts of Austalia?) and extends westwards to Madagascar. Some of its subspecies are well defined and may already have attained the status of species; but I keep them together in order to emphasize their geographical and morphological connection. As explained on p. 262, their distribution is puzzling.

The chief distinctions of the subspecies are found in the male antennae, which are pectinate, subpectinate, dentate or subdentate; the subdentate antenna is the most widely distributed one, the others being more localized. The figures represent segments 25–29. The teeth of segments 18–25 are somewhat longer as a rule.

(a) ***U. pulchelloides pectinata*** Hampson 1907 (text-figs. 244–247).

*Utetheisa pectinata* Hampson, *Ann. Mag. N.H.* (7), xix, p. 240 (1907) (Port Essington); Roths. in Seitz, *Macrolep.*, x, p. 260, pl. 13*k* (1914) (partim; *ruberrima* not this subsp.); Strand, in Wagner, *Lep. Cat.*, pars 22, p. 362 (1919) (partim); Hamps., *Lep. Phal. Suppl.*, ii, p. 509, no. 2084*a*, pl. 68, fig. 17 (1920).

Scarlet dots along anterior side of subcostal vein of forewing above short, the third rarely longer than broad.—On underside the postmedian projection



of the black border separated from margin in cellule 2 by the white scaling penetrating backwards to vein 2; the black discocellular bar of forewing nearly always completely united with the discal band; in many specimens there are one or two scarlet spots at the costal margin of the hindwing.

♂. Antenna pectinate (text-figs. 244-247), the ciliate ventral area of the median segments a narrow ridge, which strongly slants upwards proximally; width from tip to tip of projections more than twice the length of segment.

♀. Sinus of sternum VII rather wide, at most one-third deeper than apically broad; apex of lobes more or less truncate, wider than the sinus is deep.

*Hab.* Islands of the Arafura Sea.

In the Rothschild collection from Moa, Dec. 1902, 5 ♂♂, 3 ♀♀; Dammer, Nov. 1898, 1 ♀; Tiandoe and Tam, July 1898, 3 ♂♂, 2 ♀♀; Tenimber: Selaru, March-April 1897, 14 ♂♂, 5 ♀♀; Little Kei, May, Jan.-March, 2 ♂♂, 5 ♀♀.

(b) *U. pulchelloides umata* subsp. nov.

Like *U. p. pectinata*; red spots of forewing above somewhat larger, especially those in front of vein 1b, the third from the base being much longer than broad and extending across 1b. The postmedian section of the border of hindwing broader, the sinus in front of it smaller, in most wings separated from the white disk by a bar connecting the two sections of the border, or almost entirely suppressed.—On underside the white sinus of the border likewise small and there is only a trace of a backward extension or none at all (5 examples), or a thin whitish line shaded with black connects the sinus with vein 2; no minute scarlet spots at costal margin of hindwing.

♂. Pectinations of antenna a trifle longer than in *U. p. pectinata*. The dorso-apical margin of clasper from apex of process P<sup>2</sup> to apex of P<sup>3</sup> about one-sixth shorter than in *pectinata*.

♀. Sinus of sternum VII narrow, narrowest at apex, lobes of sternum also narrower than in *pectinata*, rounded from near sinus outwards.

*Hab.* Mariana Is.: Guam.

In the Rothschild collection from Guam, Oct. 1894, April 1895, 4 ♂♂, 2 ♀♀ (type ♂).

(c) *U. pulchelloides aphanis* subsp. nov.

In coloration like *U. p. pectinata*, but rarely with a red costal dot on underside of hindwing. Genitalia also the same. Differs in the male antenna being dentate: middle segments twice or nearly twice as broad as long.

Of some taxonomic importance on account of its geographical position, its nearest neighbours having subdentate male antennae.

*Hab.* Islands off south-east New Guinea.

In the Rothschild collection from the Louisiade Archipelago: Sudest Is., Jan.-Feb. 1916, 2 ♂♂, 5 ♀♀ (type ♂); Trobriand Is.: Kiriwini, March-May 1895, 1 ♂ (another ♂ in B.M. ex coll. Oberthür); Yanarba: Egum Is., Feb. 1895, 1 ♂.

(d) *U. pulchelloides pulchelloides* Hampson 1907 (text-figs. 248, 249).

*Utetheisa pulchella* Hampson, *Lep. Phal.*, iii, p. 483, no. 2088 (1901) (partim).

*Utetheisa pulchelloides* Hampson, *Ann. Mag. N.H.* (7), xix, p. 239, no. 2086a (1907) (partim; type from Chagos Is.); Fletcher, *Trans. Linn. Soc. Lond.* (2), xiii, 2, p. 268, no. 2 (1910) (partim: Chagos, Cargados Carajos, Coetivy, Poivre, d'Arros, Desroches, Eagle, Seychelles); Hampson, *Lep. Phal. Suppl.*, ii, p. 510, no. 2086a, pl. 68, fig. 18 (1920) (partim).

*Utetheisa lotrix*, Rothschild (error determ.), in Seitz, *Macrolep.*, x, p. 260 (1914) (partim); Strand, in Wagner, *Lep. Cat.*, pars 22, p. 361 (1919) (partim).

Like *U. pulch. aphanis*, but the teeth of the male antenna shorter, in the median segments the distance from tip to tip of the projections only one-half

longer than a segment (text-fig. 248); apical margin of clasper from lobe P<sup>2</sup> a little shorter than in *aphanis* and in about half the specimens corrugated. Sinus of sternum VII of female somewhat asymmetrical, a little less than twice as long as broad, lobes broad, subtruncate, outer angle more strongly rounded than inner one.

The percentage of wings in which vein 11 arises from the areole near its base is much higher (26 per cent.) than in other subspecies of *U. pulchelloides*.

On the Amirantes and Cargados Carajos the majority of specimens belong to the xanthochrome form, which is very rare elsewhere in *P. pulchelloides*.

*Hab.* Chagos Is.; Seychelles; Amirantes and Cargados Carajos Is.

In the Rothschild collection from Seychelles: Mahé, 3 ♂♂.

Other specimens examined from various islands in coll. T. Bainbrigge Fletcher<sup>1</sup> and the British Museum. The teeth of the male antenna are a trifle longer in the Seychelles than in the other localities, segments 18–25 being almost subpectinate on the outer side.

(e) *U. pulchelloides marshallorum* Rothschild 1910 (text-figs. 250, 251).

*Deiopia pulchella*, Hampson, in Blanford, *Fauna Brit. Ind., Moths*, ii, p. 55, no. 1279 (1894) (partim).

*Utetheisa pulchella*, Hampson, *Lep. Phal.*, iii, p. 483, no. 2088 (1901) (partim).

*Utetheisa pulchelloides marshallorum* Rothschild, *Nov. Zool.*, xvii, p. 182, no. 52 (1910) (Marshall Is.).

*Utetheisa lotrix marshallorum* (!) Rothschild, in Seitz, *Macrolep.*, x, p. 260, pl. 24g (1914).

*Utetheisa lotrix* var. *marshallorum*, Strand, in Wagner, *Lep. Cat.*, pars 22, p. 361 (1919).

*Utetheisa marshallorum*, Hampson, *Lep. Phal. Suppl.*, ii, p. 510, sub no. 2086a (1920) (quotation as species erroneous).

*Utetheisa pulchelloides* form *marshallorum*, Hampson, *l.c.*, p. 511 (1920).

Scarlet markings well developed, taken altogether larger than in *U. p. pulchelloides*; in front of vein 1b a row of 5 spots, of which spots 4 and 5 are united in most specimens, spot 4 extends forward across submedian fold, there being 2, sometimes 3, scarlet spots in front of this fold, the first of them placed behind the cell; the submarginal spots often forming an uninterrupted band; the black dots of the postdiscal row small as a rule, rarely several of them united; posterior two marginal spots little larger than the dots preceding them, sometimes even smaller.—Hindwing as in *U. p. pulchelloides*; sometimes a white transverse linear spot in the apical portion of the marginal band (in type and two other examples from the Marshall Is.); in one of the Henderson I. specimens the distal margin a little more distinctly incurved below apex than in most specimens of the various preceding subspecies.

On underside 8 of our 9 specimens from the Marshalls have a scarlet spot at the costal margin of hindwing, in 4 of them there is in addition an ill-defined scarlet streak in front of vein 5.

♂. Antenna dentate, the shaft broader than in *U. p. pulchelloides*, the teeth shorter, the ciliate non-compressed portion of the underside somewhat larger. Apical margin of clasper from process P<sup>2</sup> more or less corrugated.

♀. Sinus of sternum VII narrow, directed distinctly towards the right side as in the two subspecies following.

Vein 11 from costal side of areole or from basal point of it in 4 wings. The frequency of 10 arising free from the cell is noteworthy (Table V).

*Hab.* Marshall Is.—We place here also the specimens from Gilbert, Ellice, Tonga groups and the islands farther east. We have not seen specimens from

<sup>1</sup> I am much indebted to Mr. T. Bainbrigge Fletcher for the loan of specimens.



Fiji and Samoa. The examples available, with the exception of those from the Marshalls, are mostly rather worn.

In the Rothschild collection from : Marshall Is. 6 ♂♂, 3 ♀♀; Wake Is., Feb. 1903, 2 ♂♂, 1 ♀; Tonga Is. : Hapai, Jan. 1911, 12 ♂♂, 1 ♀; Tuamatu : Makemo, Takapolo, Hikucro, Anaa, Aug. 1925, 6 ♂♂, 2 ♀♀; Society Is. : Moorea, 1 ♂.

Additional localities of B.M. specimens : Union Is., Henderson Is., Friendly Is. Occurs probably on all the islands east of Fiji, most likely as a migrant.

(f) *U. pulchelloides darwini* subsp. nov.

*Diopaea* sp. Darwin, *Journ. Voyage Beagle*, 2nd edit., p. 485 footnote (1890) (Keeling Is.).

*Utetheisa pulchella* ab. 5, Hampson, *Lep. Phal.*, iii, p. 484 (1901) (partim; Keeling Is.).

*Utetheisa pulchelloides* Hampson, *Ann. Mag. N.H.* (7), xix, p. 239 (1907) (partim); Fletcher, *Trans. Linn. Soc. Lond.*, xiii, 2, p. 268, no. 2 (1910) (partim); Hamps., *l.c. Suppl.*, ii, p. 510, no. 2086 (1920) (partim).

*Utetheisa lotrix* ab. *papuana* Strand, in Wagner, *Lep. Cat.*, pars 22, p. 365 (1919) (partim).

Most specimens large. Forewing narrow, scarlet spots reduced and, as a rule, many of them replaced partly or entirely by olive, sometimes only the four proximal costal spots remaining crimson; the subspecies contrasting with *U. p. marshallorum*, which it resembles in size and shape; black spots of fringe sharply marked, generally nearly as black as the marginal spots below as well as above. —Sinus of marginal band of hindwing nearly always narrow.

♂. Antenna dentate as in *U. p. marshallorum*, the convex ventral ciliate area a little more rounded.

♀. Sinus of sternum VII narrow, as in *marshallorum*.

Length of forewing 17–20 mm.

*Hab.* Keeling Is. (= Cocos Is.).

In the Rothschild collection 5 ♂♂, 5 ♀♀, type ♂. In the B.M. 2 ♂♂ collected by Charles Darwin, and other specimens.

(g) *U. pulchelloides papuana* Strand 1919.

*Utetheisa pulchella* ab. 5, Hampson, *Lep. Phal.*, iii, p. 484 (1901) (partim).

*Utetheisa pulchelloides* Hampson, *Ann. Mag. N.H.* (7), xix, p. 239 (1907) (partim).

*Utetheisa pulchella* ab. *papuana* Strand, in Wagner, *Lep. Cat.*, pars 22, p. 365 (1919) (name for Hampson's ab. 5, which is a mixture).

*Utetheisa dorsifusa* Prout, *Ann. Mag. N.H.* (9), v, p. 286, no. 1 (1920) (New Guinea: Arfak).

I accept the designation *papuana* for this subspecies and select Arfak as terra typica and as the type of the name one of the two ♂♂ collected by Pratt and recorded by Hampson. If it should finally be decided that names given to "aberrations" have no claim to priority, *dorsifusa* would take the place of *papuana*.

The specimens from Arfak and the mountains back of Huon Gulf are dark; spots on head and thorax large, abdomen with an admixture of olive scaling. Black dots of forewing more or less enlarged and showing a tendency to become elongate, between them generally some black smudges; the olivaceous borders of the scarlet spots on the whole broader than usually. —Sinus in terminal border of hindwing smaller on upperside, large below; on fold of male scent-organ a more or less distinct diffuse olivaceous streak.

At lower altitudes in mandated territory and at low and high altitudes in

former British New Guinea the body and forewing are much less smudged with olive, the black dots are smaller on the whole and the scent-fold of the male has no olive streak. The extremes are connected by intergradations; there is also no sharp distinction from the next subspecies; but the series of the smaller-spotted Papuans contrasts nevertheless with the series of Australians in the latter having on the whole less conspicuous black dots.

♂. Antenna subdentate (as in text-fig. 252), the segments smaller and more rounded than in any of the preceding subspecies, the teeth very short and obtuse and barely visible in a dorsal view of the antenna. Apical margin of clasper corrugate.

♀. Sinus of sternum VII as in *darwini* narrow and oblique.

Neuration: in one wing 7 stalked with 8, and 9 with 10, no areole; in another wing 11 vestigial, being thin and short; in 5 wings 11 from base of areole.

*Hab.* New Guinea, main island.

In the Rothschild collection 20 ♂♂, 29 ♀♀ from Dutch N.G.: Arfak Mts.; Mandated Territory: Astrolabe Bay, Krätke and Cromwell Mts. (Eastern Finisterre Range), Waria R.; "British N.G.": Hydrographer Mts., Biagi on the Mambaré R., Aroa R.

(h) ***U. pulchelloides vaga*** subsp. nov. (text-figs. 228, 232, 252-254).

*Deiopeia pulchella* Auct. vetust. partim.

*Deiopeia pulchella*, Hampson, in Blanford, *Fauna Brit. Ind., Moths*, ii, p. 55, no. 1279, text-fig. 28 (1894) (partim).

*Utetheisa pulchella*, Hampson, *Lep. Phal.*, iii, p. 483, no. 2088, text-fig. 217 (1901) (partim).

*Utetheisa pulchelloides* Hampson, *Ann. Mag. N.H.* (7), xix, p. 239, no. 2086a (1907) (partim).

*Utetheisa lotrix*, Rothschild, in Seitz, *Macrolep.*, x, p. 260 (1914) (partim); Strand, in Wagner, *Lep. Cat.*, pars 22, p. 361 (1919) (partim).

Agrees in structure with *U. p. papuana*, and there is also no definite line of separation in coloration; but the darkening of body and forewing characteristic of typical *papuana* does not occur. It is possible that the dark specimens of *papuana* are the true New Guinean subspecies and that the non-darkened specimens from the eastern half of New Guinea are the result of an influx of small-spotted Australians. Is this moth a migrant in Australia?

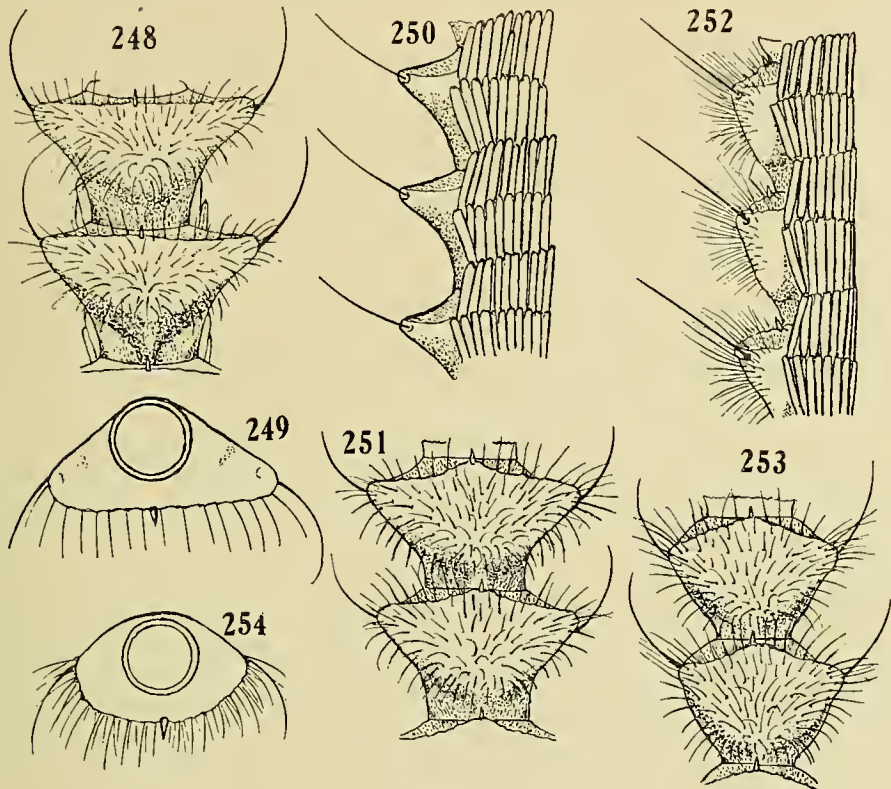
Though individually variable in coloration, and to some extent also in structure, there is no indication of geographical variation, all the specimens with subdentate male antennae, found from Australia to Madagascar and northward to Japan being *vaga*. In several localities *vaga* occurs together with subspecies which have pectinated male antennae. I have explained this fact on p. 261 by assuming that *vaga* is migratory.

As in *papuana* the six distal segments of the male antenna longer than broad; in the female the segments of the distal two-thirds longer than broad, but occasionally the middle segments shorter than usual and only the distal ones longer than broad. One of the 8 males from Guam has the antenna conspicuously dentate and the forewing nearly as brightly coloured as *U. p. umata* from the same small island. I consider the specimen to be a hybrid.

Most specimens are small, average of our 23 examples from Java 15.5 mm. forewing length; the longest wing in this series 17 mm., in our Manila series 19 mm.; the shortest wing, 11 mm., in our Hainan series.

Neuration essentially as in *papuana*; cf. table V on p. 279. Vein 10 direct from the cell in 12 of 400 wings examined.

*Hab.* Madagascar (migrant), Ceylon northward to Japan, eastward to the Moluccas, Kei and Australia; New Zealand (migrant probably). Not yet obtained on Keeling Is., but found on Tenimber and some other islands of the Arafura Sea where another subspecies occurs (*U. pulch. pectinata*).



In the Rothschild collection from New Zealand, 1 ♀ (ex coll. Felder); Australia, 10 ♂♂, 8 ♀♀; S. Australia, N.S. Wales, Queensland, West Australia; Dutch Timor: Oinanisa, 2 ♀♀; Portuguese Timor: Dili and Suai, 2 ♂♂, 5 ♀♀; Adonara, 1 ♀; Sumba, 1 ♂, 7 ♀♀; Koor, 1 ♀; Kei Toeal, 1 ♂ (together with *U. p. pectinata*); Ceram Laut, 1 ♂; Batjan, 3 ♀♀; Sula Is.: Mangoli, 1 ♀; Toekan Bessi Is.: Binongka, 2 ♀♀; Buton, 1 ♂; Central Celebes: Paloe and Kalewara, 5 ♂♂, 3 ♀♀; Saleyer, 3 ♀♀; Kalao, 1 ♂, 1 ♀; Djampea, 2 ♀♀; Philippine Is.: Panay, 4 ♂♂, 6 ♀♀, Luzon, 21 ♂♂, 47 ♀♀; Guam, 7 ♂♂, 9 ♀♀, 1 ♂ hybrid; Palawan, 1 ♂; Sulu Archipelago: Bongao, 1 ♀; British N. Borneo: Kina Balu, Mt. Marapok, Tenom, 5 ♂♂, 4 ♀♀; Sumbawa: Tambora, 1 ♂; Java, 9 ♂♂, 14 ♀♀, type of *vaga* a ♂ from Semplak, W. Java; (none from Sumatrā); Malay Peninsula: Mt. Tahan, 29 ♂♂, 20 ♀♀, Penang, 1 ♂, 4 ♀♀; Saigon, 1 ♂; Ceylon, 2 ♂♂; Bombay, 1 ♂; Hainan, various places, 37 ♂♂, 39 ♀♀; Hongkong: Kowloon, 1 ♂; Formosa, various places, 18 ♂♂, 41 ♀♀; "Japan," 2 ♂♂, 2 ♀♀.

Some additional localities in the B.M. collection: Nicobar Is.: Camorta, 1 ♂; Madagascar (ex coll. Ch. Oberthür), 1 ♂.

**9. *Utetheisa lotrix* Cramer 1777 (text-figs. 229, 234, 237, 243, 255).**

*Phalaena Tinea lotrix* Cramer, *Pap. Exot.*, ii, pp. 20 and 149, pl. 109, figs. E, F (1777) (partim; Coromandel, Tranquebar, nec Cyprus).

*Utetheisa pulchella* auctorum.

Though both sexes are easily distinguished from *U. pulchella* and *U. pulchelloides*, the species has only lately been recognized as distinct. When Cramer figured this species in 1777, he was not aware of Linnaeus's description of *Ph. T. pulchella* 1758; but at the end of vol. II, on p. 151, we find under "Additions" the reference: "Pl. CIX, E. F. La *Phal. Tinea Pulchella*. *Linn. Syst. Nat.* pag. 884, n. 349. On la trouve pareillement en Hongrie et dans la Russie." Cramer identified his *lotrix* with *pulchella*. This identification, perhaps unfortunately, was erroneous; the figure represents an Oriental specimen of the species which has been correctly identified as *lotrix* in Mr. S. Maulik's paper in *Ann. Mag. N. H.* (11), iii, p. 232, text-fig. x, pls. 8, 9 (1939); the original drawings in the British Museum (Nat. Hist.) leave no doubt. The correct identification is due to W. H. T. Tams.

Antenna simple in ♂♀. Tarsal claw asymmetrical, more so in ♂ than in ♀. Coloration as in *U. pulchella*, there being no difference applying to all the specimens; but the majority distinguished by the last two terminal spots of the forewing being elongate and, in addition, by the black dash at base behind submedian vein being absent. It is perhaps worthy of note that one finds in most specimens a black dot on the extreme base of the median vein and another a little farther from base on the submedian, the second dot being often shifted to the posterior side of the vein and sometimes prolonged into a short dash. The posterior terminal dots are short in most African specimens.

For differences in the genitalia cf. p. 268. Long scales in pocket of clasper (text-fig. 237) broader at apex, more symmetrical and more distinctly dentate than in *U. pulchella*. In order to see the tawny bristles of the apical turned-up lobe of the clasper, it is sufficient to turn the long hair-scales aside with a brush. The anal tergum dorsally carinate, being dorsally more strongly compressed than ventrally; the downward widening distally rounded, separated from the apical, dorsal, hook by a sinus, and this widened portion ventrally broader than in the other species of the genus. Sternum VII of ♀ more or less extended concave around the bottom of the sinus. Hindwing of ♂ without scent-organ; hindleg of ♂ with the modified scaling (text-fig. 255) less extended in African specimens than in Oriental ones.

*Hab.* West Africa eastward across Tropical and Subtropical Asia to New Caledonia and the Loyalty Is.

The variability of the neuration is given in Table II on p. 256.

**(a) *U. lotrix lepida* Rambur 1866 (text-fig. 243).**

*Deiopeia lepida* Rambur, *Cat. Léop. Andal.*, p. 225 footnote (1866) (Bourbon "je crois").

The only point of importance in Rambur's description of *lepida* is the reference to the genitalia: "Les pinces génitales sont bilobées à l'extrémité avec le lobe inférieure plus saillant, le stylet est comprimé de haut en bas, bifide, obtus." The description fits the clasper of *U. lotrix*. What Rambur says about the anal tergum, his "stylet," is only understandable if we assume that he had a specimen in which the tip of the tergum was broken off or in which the tergum was lying on its side.

Spots of upperside rarely scarlet (in one of our specimens and two in the Hope Department) usually more or less deep salmon, paler on the upperside than below. —On underside the red markings between cell and hindmargin as distinct as in *U. pulchella*, forming in many examples bands, which are particularly conspicuous in Madagascar specimens, more rarely in Continental ones.

Modified scaling on hindleg of ♂ very variable in extent, sometimes practically absent, in others the scales nearly as numerous as in *U. l. lotrix*, but the area much less sharply defined.

*Hab.* Ethiopian Region, inclusive of Arabia; not known from the southern half of the continent.

In the Rothschild collection from Gambia: Bathurst, 5 ♂♂, 11 ♀♀; Liberia, 1 ♀; Oasis Bilma, Nov. 1922, 2 ♂♂, 5 ♀♀; Upper Egypt: Assuan, 1 ♀; Gara, Nov. 1816; Upper Congo: Lukolele, 1 ♀; Uganda: Entebbe, Oct. 1900, 2 ♀♀; Kenya: Escarpment, Nov. 1901, 1 ♀; Abyssinia: Sekwala, south of Addis Abeba, Nov., 1 ♂, Maki R., north of L. Zuai, Nov., 2 ♂♂, Gorgoru Ganale R., April, 1 ♀, Dabele, Ganale R., April, 1 ♂, 1 ♀, Malka-Ré, Dana R., May, 2 ♀♀, Habrona, Merehan, May, 1 ♀, Solole and Hanole, Ganale R., June, 1 ♂, 1 ♀, Diré Daoua, May 1935, 1 ♂; Madagascar: Antanosy, 1 ♂, 1 ♀, Lambomakandro, Sakaraha, Tulear, March 1935, 1 ♀, "Madagascar," 5 ♀♀.

In Hope Department, Oxford, from Dahomey: Cotonou, June 1914, 1 ♂; Nigeria: Lagos, 1 ♂, 1 ♀; Egypt: Harkeko and Akeek (from the Meldola coll.), 2 ♂♂, 1 ♀; Sudan: Khartum, Feb. 1909, 1 ♂, 1 ♀, El Dueim, Feb. 1909, 2 ♂♂, Nuba Mts., Nov. 1917, 2 ♂♂; S.W. Abyssinia: Tirma, April 1925, 1 ♀.

Some additional localities in the B.M. collection—Arabia: Jidda, Feb. 1936 and 1939; Hejaz, Dec. 1927.

I have not seen any specimens from Bourbon and Mauritius, but expect them to be like Madagascar ones. Our 8 examples from Madagascar do not differ from every one of our Continental series, but are remarkably uniform in size, coloration and neurulation. The scarlet is strongly developed above and below, and the black dots are larger than in most Continental specimens; length of forewing 18–20 mm., on the Continent 15–21 mm.

(b) *U. lotrix socotrensis* subsp. nov.

*Deiopeia pulchella*, Butler (error determ.), *Proc. Zool. Soc. Lond.*, p. 179 (1881) (Socotra); Dixey, *ibid.*, p. 372 (1898) (Socotra).

*Utetheisa pulchella*, Hampson, *Lep. Phal.*, iii, p. 483, no. 2088 (1901) (partim; Socotra); *id.*, in Forbes, *Nat. Hist. Socotra*, p. 322, no. 3 (1903) (Socotra, very common).

*Deiopeia pulchella*, Rebel, *Denkschr. Math.-Nat. Kl. K. Akad. Wiss. Wien*, lxxi, 2, p. 53, no. 66 (1907) (one of the commonest Lepidoptera in the southern half of Socotra; one ♀ extended vermilion).

*Utetheisa pulchella*, Strand, in Wagner, *Lep. Cat.*, pars 22, p. 362 (1919) (partim; Socotra).

Nearest to *U. l. lotrix*; modified scaling of hindleg of ♂ as extended, and the area occupied by it on the tibia as sharply defined, as in *U. l. lotrix*, differing therein markedly from *U. l. lepida*. Scarlet markings of upperside strongly developed, with a tendency to form transverse bands, the wing appearing more scarlet than creamy white and contrasting much with the forewing of *U. l. lepida* and the series of *U. l. lotrix* from the Seychelles, Ceylon and British India; behind vein 1b a series of 3 or 4 scarlet or olive spots, which are frequently present also in *U. l. lotrix*, but are hardly ever indicated in Continental specimens of *U. l. lepida*.

*Hab.* Socotra: Adho Dimellus, Hombil, Jena-agahan, Ardahan. In B.M. 1 ♂ (type), 3 ♀♀; in the Hope Department 3 ♂♂, 1 ♀.

(c) *U. lotrix lotrix* Cramer 1777 (text-figs. 229, 233, 237, 255).

*Phalaena Tinea lotrix* Cramer, *Pap. Exot.*, ii, pp. 20 and 149, pl. 109, figs. E, F (1777) (partim ; Coromandel, Tranquebar).

*Utetheisa pulchella* auctorum (partim).

*Utetheisa pulchella* form *tenuella* Seitz, *Macrolep.*, ii, p. 73, pl. 13*k* (1910) ("East Asia," no locality specified).

*Utetheisa pulchella* v. *tenuella*, Strand, in Wagner, *Lep. Cat.*, pars 22, p. 365 (1919) (East Asia).

*Utetheisa lotrix*, Maulik, *Ann. Mag. N.H.* (11), iii, p. 232, text-fig and pls. 8, 9 (1939).

*Utetheisa pulchella* ab. *flava* Bang-Haas, *Horae Macrolep.*, i, p. 58 (1927) (Darjiling).

The figure in Seitz, *l.c.*, named *tenuella*, represents this subspecies ; East Asia being very vaguely given as the home of this "form," I select as terra typica Kowloon, near Hongkong.

The specimen with yellow instead of scarlet spots named ab. *flava* by Bang-Haas most probably belongs to this subspecies ; we have three such specimens, one each from Sumatra, Java and Celebes. A ♂ from Ajmere corresponds in colouring to *U. pulchella* ab. *bicolor*.

In nearly every specimen the two posterior terminal spots of forewing elongate, or at least longer than the spots preceding them. The scarlet spots sometimes deep salmon as in *U. l. lepida*, in none of our specimens forming more or less complete bands ; the creamy stripe in cell broader than in *U. l. socotrensis*. On underside the scarlet colouring almost completely confined to the costal spots and submarginal band, the scarlet discal spots absent or so covered with white scaling that they look very pale pink. On hindwing below always a black spot or smudge at or close to anal angle, which is absent from many specimens of *U. l. lepida*.

The subspecies is not so constantly small as one might infer from Seitz's remark about his *tenuella, l.c.*, many specimens being larger than the average *U. pulchella* ; length of forewing 14–20 mm. I have not found any differences in the material from widely separate districts except New Guinea. The area of modified scaling on the hindleg of the ♂ is sharply defined in all the localities (text-fig. 255).

*Hab.* Seychelles, Ceylon, China and Japan eastwards to New Guinea and Australia ; also on New Zealand (immigrant).

In the Rothschild collection from Seychelles : Mahé and St. Anne, all months July to Dec. 1906, 5 ♂♂, 11 ♀♀ ; Ceylon, 3 ♂♂, 3 ♀♀ ; India : Travancore, Nilgiris, Madras, Malabar, Ganjam, Muttra, Karachi, Ajmere, Sikhim, Khasia Hills, 12 ♂♂, 17 ♀♀ ; Burma, 2 ♂♂, 1 ♀ ; S.E. China : Kowloon, Taipoo and Hongkong, 6 ♂♂, 7 ♀♀ ; Japan, 1 ♂ ; Formosa : Anping and Tainan, 3 ♂♂, 4 ♀♀ ; Annam : Phuc-Son and Xon-Gom, 1 ♂, 1 ♀ ; Singapore, 1 ♂, 1 ♀ ; West Sumatra : Benkoelen and Padang Bovenlanden, 16 ♂♂, 19 ♀♀ ; Java : Buitenzorg, Garoet, Mt. Gcdeh, Tjilatjap, Pengalengan, Trettes, Nonkodjadjar, 17 ♂♂, 31 ♀♀ ; Bali : Gilmanoeck, Prapetagoeng, Mondoktoempang, "Bali," 5 ♂♂, 6 ♀♀ ; Lombok : Sapit and Sambalun, 7 ♂♂, 4 ♀♀ ; Christmas Is., 1 ♂ ; Sambawa, 1 ♂ ; Alor, 2 ♀♀ ; Pura, 2 ♀♀ ; Dutch Timor : Oinanisa, 1 ♀ ; Kisser, 6 ♂♂, 2 ♀♀ ; Tenimber, 2 ♂♂ ; Koer, 2 ♂♂ ; Banda, 1 ♂ ; South and Central Celebes, 5 ♂♂, 5 ♀♀ ; North Borneo : Labuan, 1 ♂ ; Palawan, 1 ♂ ; Philippine Is. : Luzon, 1 ♂, 1 ♀, Panay, 2 ♂♂ ; New Guinea : Astrolabe Bay, 3 ♂♂, 4 ♀♀, Aroa R., 1 ♂ ; Dampier I., 3 ♂♂, 4 ♀♀ ; Vulcan Is., 4 ♂♂, 4 ♀♀ ; French Is.

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(Witu), 1 ♀; Goodenough, 1 ♀; Sudest Is., 2 ♂♂; North Australia: Port Darwin, 2 ♀♀, Eureka, 6 ♂♂, 3 ♀♀; West Australia: Sherlock R., 1 ♀, Roebourne, 1 ♀, Perth, 1 ♀; Queensland: Cairns, 2 ♀♀, Toowoomba, 2 ♂♂, 3 ♀♀, Bowen, 1 ♂, Mackay, 2 ♀♀, Brisbane district, 2 ♂♂, 1 ♀, "Queensland," 5 ♂♂, 5 ♀♀; New Zealand (coll. Felder), 1 ♀.

Some additional localities in the B.M. collection—Nicobar Is.: Camorta; West China: Moupin and Pu-tsu-fong; Amboina (1 ♀, ex coll. Orberthür).

The 27 specimens in the Rothschild collection from New Guinea and the islands nearby on the eastern side are remarkable as a series in as much as in 44 per cent. of the forewings the discocellular black bar on the underside is connected with the discal band, whereas this is the case only in 4 per cent. of the specimens from the Malay Archipelago. The specimens do not seem to differ in any other way except in neuration (see Table II, p. 256).

It is rather surprising that we have no specimen of *U. lotrix* from Hainan and only a few from the Philippines whence there are in the collection large numbers of *U. pulchelloides*, and that the Moluccas proper are represented but by a single example in the long series of *U. lotrix* examined. The species seems to be commoner in the southern than in the northern districts of the Oriental Region, and its range is more restricted in the Pacific than that of *U. pulchelloides*.

#### (d) *U. lotrix stigmata* Rothschild 1910.

*Utetheisa pulchelloides stigmata* Rothschild, *Nov. Zool.*, xvii, p. 182, no. 48 (1910) (N. Caledonia, Loyalty Is.); *id.*, *l.c.*, xviii, pl. 6, fig. 27 (1911).

*Utetheisa lotrix stigmata* Rothschild, in Seitz, *Macrolep.*, x, p. 260, pl. 13k (1914) ("Freundschafts-inseln" in error for Loyalty Is.).

*Utetheisa lotrix* var. *stigmata*, Strand, in Wagner, *Lep. Cat.*, pars 22, p. 361 (1919).

*Utetheisa pulchelloides* form *stigmata*, Hampson, *Lep. Phal. Suppl.*, ii, p. 511 (1920).

The black dots of forewing above larger than usual, at least some of them merged together; discocellular spot of hindwing large, black border broad.—Black markings of underside likewise enlarged, particularly the black discal band broader than usual and frequently connected with the discocellular black bar; the proximal costal spot of the hindwing not rarely continued by a line across the cell.

The red specimen mentioned by Lord Rothschild in 1910 and termed by him *ab. rubra* in Seitz belongs to the next species. The type of *stigmata*, a ♀, is from Lifu.

*Hab.* Loyalty Is.; New Caledonia; New Hebrides; Fiji.

In the Rothschild collection from New Caledonia: Nouméa, 6 ♀♀; Loyalty Is.: Lifu, 1 ♂, 4 ♀♀.

In the B.M. from the New Hebrides (nearly all collected by Miss Cheesman): Aneityum, Tanna, Hog Harbour, 5 ♂♂, 6 ♀♀; Fiji, 1 ♂ (colouring of forewing very dull).

#### 10. *Utetheisa sumatrana* Rothschild 1910.

*Utetheisa sumatrana* Rothschild, *Nov. Zool.*, xvii, p. 182, no. 51 (1910) (Delhi, N.E. Sumatra); *id.*, *l.c.*, xviii, pl. 6, fig. 31 (1911); *id.*, in Seitz, *Macrolep.*, x, p. 260, pl. 24g (1914); Strand, in Wagner, *Lep. Cat.*, pars 22, p. 366 (1919); Hampson, *Lep. Phal. Suppl.*, ii, p. 512, no. 2089a (1920).

*Utetheisa lotrix stigmata* *ab. rubra* Rothschild, *l.c.*

Forewing above Chinese orange, a little deeper red towards base, markings more or less obliterated, usually a white streak in cell.—Hindwing white,

the black border varying from being absent to being nearly like that of *U. pulchella*.

Underside of forewing white from middle of cell to hindmargin ; black discal band indicated or distinct.—Apex of hindwing with an ill-defined Chinese-orange patch, distal margin more or less washed with the same colour.

In the specimen called ab. *rubra* by Rothschild the forewing is an orange-scarlet, with the dark markings more extended and more numerous ; fringe with olive-brown spots corresponding to the marginal spots of the same dull colour ; hindwing with discocellular bar and narrow black margin which has a broad projection behind lower median, this projection longer than broad.—On underside the hindwing with orange-scarlet apical patch like normal specimens.

This specimen was received from Messrs. Watkins and Doncaster together with other set material labelled Lifu, Loyalty Is. I consider the specimen to have got mixed up with the Lifu material on the setting boards.

*U. sumatrana* is a very puzzling species. It is so different in coloration from *U. lotrix* that the close agreement in structure with that species is surprising.

*Hab.* N.E. Sumatra.

In the Rothschild collection 2 ♂♂, 2 ♀♀ from Deli, N.E. Sumatra.

In the Dohrn collection at Stettin 8 specimens ; one of the females with the hindwing nearly as in *U. pulchella*, according to the information very kindly sent me by Dr. Urbahn.

#### 11. *Utetheisa semara* Moore 1859 (text-figs. 230, 234).

*Utetheisa* (!) *semara* Moore, in *Horsf. & Moore, Cat. Lep. East-Ind. House*, ii, p. 307, no. 712, pl. VIIa, fig. 12 (1859) (Java).

*Utetheisa semara*, Hampson, *Lep. Phal.*, iii, p. 485, no. 2089 (1901) (Java) ; Rothschild, in Seitz, *Macrolep.*, x, p. 260, pl. 24g (1914) ; Strand, in Wagner, *Lep. Cat.*, pars 22, p. 366 (1919) (Java).

For distinctions in the genitalia, see p. 258. Forewing above olive-brown, with dark-red streak along costal margin, elongate spots of the same colour between the veins and more or less elongate black spots, a dull creamy-white streak in cell from base on to disk.—Hindwing white, without discocellular spot ; olive-black distal border nearly even in width.

TABLE VI.  
NEURATION OF *U. SEMARA*.

	Celebes Wings.	Lombok Wings.	Java Wings.	Percentage of all the Wings.
Number of wings . . . . .	30	16	6	52
With areole :				
(a) Vein 10 from areole . . . . .	2	—	3	10%
(b) Vein 10 on a short stalk with 8.9	6	10	—	30%
(c) Vein 10 on a long stalk with 8.9	1	1	2	8%
Without areole :				
(d) Vein 10 from 7.8.9 . . . . .	—	1	—	2%
(e) Vein 10 direct from cell . . . . .	21	4	1	50%
(f) Vein 11 from areole or from 10.	17	8	4	56%

The numbers of specimens we have are not large enough to make the comparison of the neuration of the Lombok and Celebes examples reliable ; nevertheless, the result shown in the table is interesting, if compared with Table II on



p. 256 : vein 10 rarely arises from the apex of the areole and very frequently free from the cell (50 per cent.), and the latter is much more often the case in Celebes than in Java and Lombok ; vein 11 is in 17 of the 30 Celebes wings on a short stalk with 10 and in 8 of the 16 Lombok wings, whereas in *U. pulchella* and *U. lotrix* this happens rarely.

*Hab.* Java, Lombok and Celebes.

In the Rothschild collection from West Java, 1 ♂ ; Lombok : Sapit and Sambalun, 3 ♂♂, 5 ♀♀ ; South Celebes : Bua-kraeng, Lampa-Battan, Bonthain, 4 ♂♂, 7 ♀♀ (the other 4 specimens examined are in the B.M. coll.).

EXPLANATION OF TEXT-FIGURES.

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255.	Diagram of scaling of outer surface of hindtibia of <i>U. lotrix</i> <i>lotrix</i>	p. 288